Spring 5-20-2013

Habitat Use Analysis of a Reintroduced Black Rhino (Diceros bicornis) Population

John H. Clark
Western Kentucky University, John.Clark413@topper.wku.edu

HABITAT USE ANALYSIS OF A REINTRODUCED
BLACK RHINO (*Diceros bicornis*) POPULATION

A Capstone Experience/Thesis Project

Presented in Partial Fulfillment of the Requirements for

the Degree of Bachelor of Science with

Honors College Graduate Distinction at Western Kentucky University

By

John H. Clark

*****

Western Kentucky University
2013

CE/T Committee:

Professor Michael Stokes, Advisor

Professor Bruce Schulte

Professor Michael Smith

Approved by

____

Advisor
Department of Biology

ABSTRACT

Prior to the 20th century black rhinos (*Diceros bicornis*) were the most prevalent rhino species with population estimates reaching 850,000 individuals (Rhino Resource Center, May 2013). The black rhino underwent the single fastest and most severe decline of all large mammal species from the 1960s to the 1990s, resulting in current population estimates of 3,600 animals (Emslie, 2012; Hillman-Smith and Groves, 1994). Reintroduction efforts are taking place to restore this species and 19 animals were reintroduced to a Kruger Associated Private Nature Reserve, six of these individuals were accessible for study. Animals were monitored on a regular basis and home ranges were developed. Forage data were collected through back tracking a standard bite estimator (Buk, 2004). The forage data were then compared with vegetation availability calculated from random plots that fell within home ranges and electivity indexes were calculated. The vegetation within home ranges was compared to the data from vegetation across the entire study area and to only the vegetation that fell outside of home ranges; a significant difference was between each comparison. Water analyses and visibility indexes were conducted; these were analyzed through a principal component analysis. A rotated component plot was developed and the factor scores for each waterhole were projected on the map and coded for the number of rhino visits that occurred in a defined period. The graph does not indicate that any relationships among the variables would be useful

for predicting rhino water hole use. The significant difference between the vegetation make up within home ranges compared to the vegetation across the entire study site along with several high electivity indexes do indicate that the animals are utilizing the habitat differentially across the landscape. This differential use could indicate that the reserve's management plan calling for a six to seven percent off take per year could be unsustainable and would need amending.

Keywords: black rhino, *Diceros bicornis*, reintroduction, forage, feeding, habitat use

ACKNOWLEDGEMENTS

This project would not have been possible without the help and support of numerous individuals and groups. Many thanks goes to Dr. Michael Stokes for the active role he has played in bettering my education at WKU and for securing the initial funding and partnerships that made this project possible. Thanks should also go to Craig Spencer, Warden of Olifants West Nature Reserve for his cooperation in the partnership and field assistance. Stefan Bosman, Warden's staff at Olifants West, played a large role in the collection of animal locations and familiarizing me with the area. Francois Van Der Mewre, also a member of the Warden's staff, helped familiarize me with the woody vegetation of the area in my initial stages of the research.

Many other people at WKU also deserve thanks. Rachel Beyke assisted with animal location monitoring and visibility indexes for this study, while also gathering data for another analysis of the same population. Adam Edge played a large role in assisting with vegetation sampling, and Dr. Danielle Brown assisted with vegetation sampling as well.

Thanks also go to Dr. Audra Jennings in the Office of Scholar Development for her help in preparing scholarship and grant applications. Funding was provided by the WKU Research and Creative Activities Program, WKU Honors College, WKU Office of

Undergraduate Research, WKU Study Abroad Office, the Morris K. Udall Foundation, and the Foundation for Global Scholars.

Of course thanks also go to my friends and family for their support throughout my collegiate career and to my fiancée, Ashley McCloughan for not killing me for leaving the country for six and half months to conduct research.

VITA

June 9, 1991……………………………………………………………………...Born
Bowling Green, KY

2009……………………………………...Graduated
Bowling Green High School
Bowling Green, KY

2010…………………………………………………………….................Study Abroad
Harlaxton College
Grantham, England

2012…………………………………………………………………Research Abroad
Republic of South Africa

2013…………………………………………………………..Anticipated Graduation
Western Kentucky University,
Bowling Green, KY

PRESENTATIONS

March 23, 2013……………………………Midwest Ecology and Evolution Conference
Notre Dame University, South Bend, IN

FIELD OF STUDY

Major: Biology

TABLE OF CONTENTS

Page

Abstract……………………………………………………………………………………ii

Acknowledgements……………………………………………………………………….iv

Vita………………………………………………………………………………………vi

List of Figures……………………………………………………………………………ix

List of Tables…………………………………………………………………………...x

Chapters:

1. Introduction………………………………………………………………………….1

2. Methods…………………………………………………………………………...9

    I. Study Area……………………………………………………………………9

    II. Animal Monitoring…………………………………………………………..11

    III. Forage Data………………………………………………………………..12

    IV. Vegetation Availability………………………………………………………15

    V. Dam Usage………………………………………………………………...16

    VI. Waterhole Characteristics ……………………………………………...18

3. Results………………………………………………………………………………...20

    I. Animal Locations…………………………………………………………….20

    II. Vegetation Availability………………………………………………………21

    III. Forage Data………………………………………………………………..22

IV. Dam Usage……………………………………………………………………..25

V. Waterhole Characteristics…………………………………………………26

4. Discussion……………………………………………………………………….30

Works Cited………………………………………………………………………...33

Appendices:

A. 75% Minimum Convex Polygon Home Ranges
And Sampling Points……………………..……………………………………...36

B. Raw Telemetry Data…………………………………………………………37

C. Location Estimates…………………………………………………….………..50

D. Raw Forage Data……………………………………………………………….52

E. Vegetation Inside 75% Minimum Convex Polygon Home Ranges…………………69

F. Vegetation Outside 75% Minimum Convex Polygon Home Ranges………………..82

G. Electivity Indices, Diet Percentages, and Availability Percentages…………………98

H. Visibility Indexes…………………………………………………………...100

I. Water Quality Samples…………………………………………………………..104

LIST OF FIGURES

Figure Page

1.1 Black Rhino……………………………………………………………………….1

1.2 White Rhino……………………………………………………………………….1

2.1 Surface Water, 2009…………………………………………………………...10

2.2 Camera Trap Photograph………………………………………………………...17

3.1 75% Minimum Convex Polygon Home Ranges and Sampling Sites……………20

3.2 Component Plot in Rotated Space……………………………………………….28

LIST OF TABLES

Table Page

2.1 Percent of Variance Explained per Component……………………………………19

3.1 75% Minimum Convex Polygon Home Range Results………………………….21

3.2 Principal Taxa……………………………………………………………………24

3.3 Preferred Taxa……………………………………………………………………25

3.4 Waterhole Uses, Home Range Overlap, and Expected Uses…………………….25

3.5 Descriptive Statistics of Waterhole Characteristics……………………………...26

3.6 Principal Component Analysis,
Percent of Variance Explained per Component………………………….27

3.7 Component Plot Values………………………………………………………..…29

3.8 Waterhole Component Plot Values………………………………………………29

CHAPTER 1

INTRODUCTION

A rhino is one of any five surviving, odd toed species from the family Rhinocerotidae. Rhinos formerly inhabited North America and Europe however, the extant species are only found in Asia and Africa (Dinerstein, 2011). The Asian species include the greater-one horned (*Rhinoceros unicornis;* Vulnerable), Javan (*Rhinoceros sondaicus*; Critically Endangered), and Sumatran (*Dicerorhinus sumatrensis*; Critically Endangered) rhinos, while the African species include both the northern (*Ceratotherium simum*; Critically Endangered) and southern (*Ceratotherium simum* ssp. *simum*; Near Threatened) white rhino, along with the black rhino (*Diceros bicornis*; Critically Endangered) (IUCN, 2012).

F

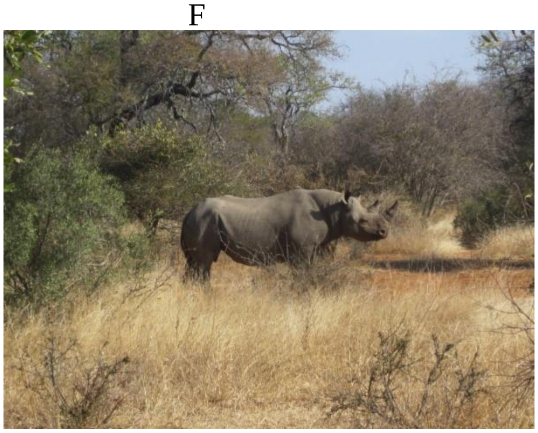


Fig1.1 Black Rhino

Fig 1.2 Southern White Rhino

The black rhino evolved roughly four million years ago and was widespread across sub-Saharan Africa until recent declines due mostly to hunting and illegal poaching (Dinerstein, 2011). The species was able to occupy a variety of habitats ranging from the deserts of Namibia to montane Kenya; they occupied all of sub-Saharan Africa except for the Congo Basin (IUCN). The black rhino's range is now limited to national parks and nature reserves in Namibia, South Africa, Zimbabwe, Malawi, Tanzania, and Kenya (Rhino Resource Center). This restriction in range has inherently been accompanied by a massive reduction in the number of wild individuals. Prior to, and early in the 20th century black rhinos were by far the most prevalent rhino species, with population estimates reaching approximately 850,000 individuals (IUCN, 2012). However, by the 1960's fewer than 100,000 individuals were alive and the current estimate for animals in the wild is approximately 3,600 individuals (Emslie, 2012; Rhino Resource Center, May 2013).

The numbers of black rhinos in Africa were originally diminished by European hunters, but the largest threat that every rhino species now faces comes from the illegal trade of rhino horn (Dinerstein, 2011). Trade in rhino horn is now restricted by the Convention on International Trade in Endangered Species (CITES),but due to its use in eastern traditional medicine and as symbolic dagger handles in middle-eastern cultures rhino horn is still extremely valuable on the black market. Within traditional eastern medicine, rhino horn is more valuable than any other exotic animal product and is primarily used to treat fevers, not as an aphrodisiac as is commonly believed by most in western culture. CITES has banned the international sale of rhino horns and products made from horns in participating countries, however, China still permits hospitals to use confiscated rhino horn as a fever reducer in emergency situations and a new use of rhino horn is as a perceived cure for cancer (Dinerstein, 2011; Emslie, 2012).In many middle-eastern countries, rhino horn is sought out to be made into decorative dagger handles that are often ritualistic coming-of-age gifts for young men (Dinerstein, 2011). However, rhino horn is comprised of keratin and resembles tightly compressed hair and has no medical properties. In fact, intense testing by the Hoffman La Roche Institute found that rhino horn has no analgesic, anti-inflammatory, diuretic, or bactericidal effects and that "ingesting rhino horn is the same as chewing your own fingernails"(Izzeddin, 1983).

Recently, the high demand and the resulting high prices of rhino horn has led to record poaching incidents, and well developed and highly sophisticated crime syndicates have become involved (Conniff, 2011). Even personnel formerly engaged in conservation activities and employed to protect rhinos have been found participating in rhino poaching (Berger et al. 1993). The number of poached rhinos in South Africa has increased from 333 in 2010 to 668 in 2012, driven by its $65,000 per kilogram value on the black market (Biggs et al., 2013). From the beginning of the year until March 13th, 2013, 146 rhinos had been poached in the Republic of South Africa alone ("Update on the…," 2013). Despite increased poaching in recent years, the black rhino population is currently trending upwards, but is still in desperate need of recovery, as this species has experienced the single fastest and most severe decline of any large mammal species from the 1960's to 1990's with a decrease of more than 90% in protected areas and total extirpation in others (Emslie, 2012; Hillman-Smith and Groves, 1994).

In the 1990s many conservation groups began a well-intentioned plan to convince users of traditional eastern medicines to utilize alternatives to rhino horns out of their concern for the extinction of many rhino species (Huang, 2013). Herbaceous plants such as Sheng Di Huang (*Rehmanniae Radix*) were identified as acceptable substitutes for rhino horn and the horn of the saiga antelope (*Saiga tatarica*) was also specifically mentioned as a suitable alternative to rhino horn. While this promotion of the use of saiga horn was well intentioned, the results were horrific. The total population of saiga antelope, which numbered over one million animals was reduced to approximately 30,000 and the species was listed as critically endangered by the IUCN in 2003 as a direct result of sudden poaching pressure for use in traditional eastern medicines (Huang, 2013). The saiga antelope is still listed as critically endangered by the IUCN (IUCN, 2012). Despite the identification of substitutes for rhinoceros horn, illegal poaching has continued to trend upward and threaten rhino populations.

Recently, a new line of thinking has emerged in efforts to protect rhinos worldwide. Some researchers, such as Biggs et al. (2013), are encouraging the legalization of rhinoceros horn trade that is conducted in a renewable manner and overseen by a central agency. In their argument, they initially point to the failure of banning the trade in rhinoceros horn to reduce poaching and indicate how the drastically increasing price of rhino horn has led to skyrocketing poaching in recent years. They point out that this has also led to a militarization of rhino protection with ever increasing financial and human costs. Because rhinoceros can re-grow their horn, and can be safely de-horned by managers in a low risk manner, these authors have suggested that private landowners in South Africa be allowed to de-horn their rhinos for sale on the open market and that the supply of horns be augmented by the collection of horns through natural rhino deaths. They believe that the funds generated by this trade would fund rhino protection, provide a financial incentive for landowners to keep rhinos, and lead to a reduction in the number of rhinos killed by poachers. Biggs et al. (2013) claim that this reduction in poaching will occur if the following conditions are met: 1) regulators can prevent illegal horn from slipping into the legal market; 2) the legal supply can more easily and effectively deliver the horn; 3) the demand does not escalate tremendously; and 4) legally harvested horns can substitute for horns taken from animals poached in the wild. As an initial supply to attract buyers away from black market horn, the authors suggest that the 15-20 tons of stockpiled horns in South Africa be placed on the market, and have a portion of that held in reserve in case the demand escalates (Biggs et al., 2013).

While authors like Biggs et al. (2013) support legalized trade in rhino horn through sustainable harvest from deceased animals and live dehorning, others have claimed that dehorning could have negative effects upon rhinoceros populations. For example, Berger (1994) outlines the following three major hypotheses concerning the role of rhino horns: 1) function intrasexually in combat, 2) serve in mate choice, and 3) deter predators. When testing the hypothesis that rhino horns function intrasexually in combat, Berger and Cunningham (1998) found that horn size was consistently related to dominance in male black rhinos, and that when asymmetries greater than 12cm existed the smaller horned rhinos were at significant disadvantages. As rhinos have the highest known rate of fatal fights for any mammal, any difference in horn size between individuals might lead to increases in the number of mortalities sustained (Berger and Cunningham, 1998). Therefore, any dehorning program would have to be able to ensure that all rhinos in a population are regularly dehorned at the same time and that no horned animals are able to enter the population. In reference to the role horn may play in predator deterrence, Berger et al. (1993) studied populations of both horned and dehorned rhinos and found that all the dehorned mothers lost their calves during the five year study period, but that no horned mothers lost calves. In a response publication, Berger et al. (1994) also stated that they observed a 16% decrease in a dehorned population compared to a 25% increase in a horned population. Based on these studies it is clear that the presence of horns plays a role in rhino populations growth and the removal of that horn could potentially have a substantial negative impact upon that population. Dr. Coleman O'Criodain, a wildlife trade policy analyst working with World Wildlife Fund (WWF), was reported by the BBC as stating that the WWF does not support a legalized trade because they simply do not think it is enforceable (McGrath, 2013). He claims that the WWF is not convinced that enforcement would actually prevent the laundering of poached horn into the legal system and thinks that the legal trade would worsen the poaching crisis (McGrath, 2013).

According to Emslie (2012) the black rhino population is currently increasing, but the reintroduction of this species, and other mega-fauna, to private lands may be the only way for them to survive as species, regardless of whether a legalized horn trade is established or not (Gottert, 2011). Many of these privately owned reintroduction sites are not operated on the same principles as national parks and are multiple-use lands, which allow for the consumptive use of wildlife, particularly through trophy hunting. My study is based upon data my colleagues and I gathered from a subset of animals reintroduced to one such private nature reserve in the Kruger National Park area. The Eastern Cape Parks and Tourism Authority agreed to provide the founder population of 19 animals, and the reintroduction was facilitated by the World Wildlife Fund Black Rhino Expansion Project. The relocation site is hoping to meet the following goals through this reintroduction project: 1) contribute to the conservation of black rhinos, 2) promote the expansion of habitat available to black rhinos up to a size with an ecological carrying capacity of at least 60 individuals, 3) maintain an actively growing population which may give an off-take of 6-7% per year, 4) encourage the sustainable utilization of black rhinos within the reserve through live sales and translocations, 5) ensure the expectations of visitors to the reintroduction area are met with regards to the viewing of black rhinos, and 6) co-operate with conservation bodies, academic institutions and other parties interested in the protection and conservation of black rhinos (Ferguson 2011).

In keeping with the sixth goal of the reintroduction, for the reserve to cooperate with others interested in black rhino conservation, a partnership was formed between WKU and Olifants Nature Reserve. In 2012 Rachel Beyke, Dr. Michael Stokes, and I traveled to South Africa and arrived in Olifants West Nature Reserve in mid-June. Dr. Stokes remained for several weeks to oversee the beginning of this project and another he was heading. Rachel Beyke and I remained in the reserve until mid-December of 2012 as part of a location monitoring team. During that time I also conducted vegetation plot sampling, collected rhino forage data, compiled visibility indexes of the land immediately surrounding several waterholes, and collected water samples that were analyzed by ENDIP Wildlife Laboratories.

The goal is to determine whether the animals were using the habitat homogenously or if differential use was occurring. Once known, the results will be used to evaluate the sustainability of the section of the management plan that calls for a six to seven percent off take from the population per year. The second goal is to provide information that will be useful in selecting the most ideal locations for future black rhinoceros reintroductions. I hypothesize that differential habitat use will be associated with differences in the vegetation within the home ranges and the remainder of the reserve, and that rhinos will use waterholes differently based upon certain waterhole characteristics.

CHAPTER 2

METHODS

Study Area

The release area was Balule Nature Reserve, reserve of approximately 379.77 square kilometers, or 37,977 hectares. The properties within the reserve had previously been used as cattle farms, but approximately 31,977 hectares of the area has been involved in the wildlife industry and eco-tourism since the early 1900s. Another 3,000 hectare property ceased cattle production in the 1960s and the remaining 3,000 hectares ceased cattle production in the early 1900s (Ferguson, 2011). In 1991, the owners involved in eco-tourism began removing the internal fencing separating distinct properties to allow the wildlife to move throughout the reserve unimpeded. In 2005 the wildlife fence separating the reserve from Kruger National Park was removed, thus allowing the free movement of game into and out of the Kruger National Park and all of its associated areas, now known as the Kruger Associated Private Nature Reserves. The borders that are not open to the Kruger National Park are closed with a 2.1 meter tall, 21-strand galvanized wire fence which also has three additional offset and electrified wires.

The reserve is subdivided into six separate, autonomously operating regions. Of the 19 animals released throughout Balule Nature Reserve, seven maintained a regular presence in the 8,819 hectare Olifants West Nature Reserve, the study region. The entire reserve is situated within the savanna biome and the majority of the reserve, including all of the specific study area, is classified as supporting a granite lowveld vegetation community (Munica and Rutherford, 2006). The precipitation is generally low and fairly erratic, as is common in semi-arid savanna. The yearly average for the last 25 years was 418 mm per year with high year-to-year variation. The wet season is generally 5-7 months and begins in October and can last until May. During the study period the first rains began in September. A river runs through the reserve and when swollen represents a barrier to animals, but the river and large number of active waterholes shown in figure 2.1 have created a situation on the reserve in which black rhinos would experience little to no water stress. The region experiences hot summers with temperatures ranging from 18-45°C and mild winters ranging from 8-23°C. Most of the reserve has mild slopes, but the areas closer to the river have steeper slopes, habitat considered ideal for black rhino. It has been estimated that this area has an ecological carrying capacity of approximately 75 black rhinos (Ferguson, 2011). The estimate was not made specifically for this area and was compiled based off of estimates for other semi-arid reserves.

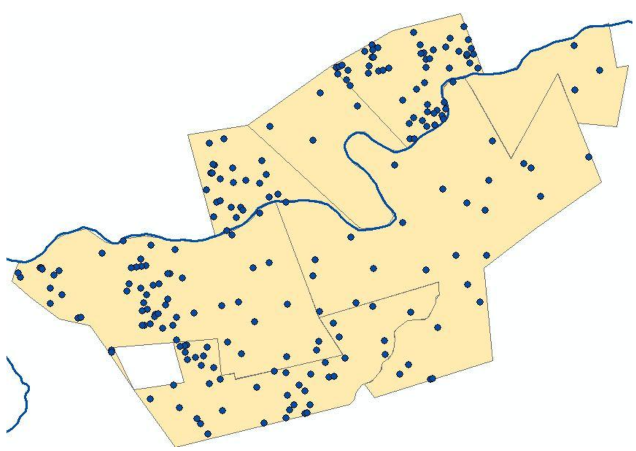


Figure 2.1: Surface water, 2009

Animal Monitoring

Following the reintroduction all individuals were located as often as possible by reserve staff. Beginning in June 2012, seven months after the reintroduction we began to locate the rhinos for this research, preferably 1-3 times per week, and locations were recorded on GPS units that were accurate up to 3 meters. The animals were located through the use of Advanced Telemetery Systems long-range radio transmitters to obtain visuals, and through locations generated by radio telemetry. Each individual could by identified by either horn or ankle transmitters that were tuned to specific frequencies and by specific ear notches.

To obtain the locations technicians would begin scanning for individual rhinos from high points along the reserve. Visual sightings were given a priority, so when time permitted the telemetry equipment would be used to estimate the distance and direction of an animal, we would then drive within walking distance of the animals and one to two technicians would approach the animals on foot. Once the technicians obtained visuals or entered a situation in which it was unsafe to continue but were very near to the rhino, a Garmin GPSmap 62S unit was used to record the technician's position. These units are accurate to three meters. The technician's position was then entered as the rhino location for analysis. Rachel Beyke and I operated the telemetry equipment, as well as approaches on foot with the guidance of Stefan Bosman, a member of the warden's staff. When multiple animals were encountered at the same time, or when viewing pictures, individuals could be identified through the unique set of ear notches given to each and were assigned a health rating based on methods in *Monitoring African Rhino Trainee's Guide* (Adcock and Emslie, 2007).

When multiple C sightings were collected, the bearing of the animal from each receiver location was used to estimate a location; this was done using LOAS 4.0, which was created by Biological Solutions Software. These location estimates, along with the A (visual) and B (close proximity with no visual) sightings were combined and used to develop minimum convex polygon home ranges in Biotas 2.0 Alpha, another program developed by Biological Solutions Software. The home ranges developed in Biotas 2.0 Alpha were saved as shapefiles and used to create home range maps in ArcMap 10.0, which was created by Esri. All maps shown in this document were created using ArcMap 10.0.

Forage Data

Black rhinoceros browse has been studied over the years using multiple methods. Van Lieverloo and Schuiling (2004) analyzed black rhino diet in the Great Fish River Reserve, South Africa through the use of fecal analysis, but also used the backtracking method to compare results of the two. Backtracking involves locating actively feeding animals and following the feeding trail away from the animal to minimize observer impact (Brown, 2008). They discovered that each method yielded similar results; however, fecal analysis showed that grass amounted to 4.5% of black rhino diet while backtracking did not identify any grasses in the diet. Additional methods of determining browse selection include direct observation of feeding animals and the browse-bottle method as described by Emslie and Adcock (1994), which can be utilized while backtracking. Each method has its own distinct set of advantages and disadvantages.

The largest drawback of fecal analysis is that it is the most costly method. It involves identifying and then quantifying the undigested cuticle or epidermal fragments of consumed food items. While it is possible to identify many plants down to species level, a collection of samples for possible food items must first be acquired and the researcher must either undergo training or procure funding for lab fees (Brown, 2008). Budgetary restrictions prevented us from using the fecal analysis method.

Direct observation is well suited to open environments and involves the observation of feeding individuals while technicians record the number of bites the animal takes on each plant (Brown, 2008). The study area for this project was quite dense, so direct observation was not possible, especially as black rhinos feed mostly at night.

The browse-bottle method (Brown, 2008) involves estimating the total volume of each bite for each species and then using that information to calculate each species' proportion of rhino diets. However, the use of a standard bite estimator in which the researcher could estimate the number of bites taken from a particular species is recommended by Buk (2004). A standard bite is defined as all the severed twigs less than 5 mm in diameter within a circle with a 10 cm diameter, or one larger twig (Buk, 2004). The standard bite estimation method is recommended because the two methods yield similar results but the standard bite method is much simpler than the browse bottle approach (Brown, 2008).

Backtracking involves following the paths of recently feeding animals and recording what each animal ate. This method has several advantages, including: it can be accomplished in dense vegetation where visibility is compromised, it is suited to arid and semi-arid areas in which the soil type greatly assists in tracking, and it is inexpensive (Brown, 2008). Backtracking also has the advantage of allowing the researcher to sample feeding that may have occurred at night, and puts minimal stress on the study animals from disturbance (Buk and Knight , 2004). Some distinct disadvantages of backtracking include the inability to detect feeding on grasses, fallen fruits, and forbs (Buk and Knight, 2004). Upon location of a feeding trail, fresh black rhino feeding can be differentiated from older feeding and the feeding of other species by the freshness of bites, thickness of severed twigs, clustering of severed twigs, presence of tracks or other signs, and the distinct 45 degree angle at which a black rhino bites off twigs as described by Oloo et al. (1994). Due to budgetary constraints, the dense vegetation of the study area, and the sandy soil, I used backtracking combined with the standard bite estimator to gather forage data.

Differing methods have shown black rhino diet to be composed of different plant types. Using fecal analysis, Lieverloo and Schuiling (2004) determined that approximately 4.5% of black rhino diet was comprised of grasses, while their comparison study using back tracking indicated that black rhino ate no grasses. Matipano (2004) studied the diet composition taking forbs, woody plants, and herbaceous plants into consideration and found that woody browse made up over 74% of rhino diet for each group studied: captive, hand-raised, and wild rhinos, and was over 90% for the wild group. While forbs and herbaceous plants were found in the diet, woody species made up most of the diet by far.

Once I procured forage data, I could easily determine principal food items, the items that an animal eats the most (Winkle, 2004). However, in order to determine which food items are preferred, the proportion of each item in the animals diets must be divided by the proportion available (Petrides, 1975). A numeric value which serves as an indicator for the level of preference or avoidance was also be obtained using the following formula as described by Winkle (2004) : $E_i = (r_i - n_i)/(r_i + n_i)$ where E is the electivity measure for species i, r is the percentage of species i in the diet, and n is the percentage of species i in the environment. This equation yields values ranging from -1 to 1. A value close to -1 indicates an avoidance of a particular food item, a value of 0 shows no preference, and a value close to 1 illustrates a high preference for a particular species. Values of neither -1 nor 1 can be reached.

Vegetation Availability

Prior to any determination of the rhinoceros home ranges I defined random sampling points along the northern boundary of the study site. I then placed additional sampling points one kilometer south of each point on the northern boundary, and continued until the southern boundary of the reserve was reached, creating a series of north-south stratified plots across the reserve. Random points were later generated to locate additional plots to add to these data, and were analyzed together because the starting positions for the north south stratified plots were chosen randomly. Each set of coordinates generated from the above methods was used as the northwest corner of a 10 m X 10 m plot. Within each plot, I recorded every woody plant that was either rooted or had branches hanging into the plot to species level when possible, or at least to the level of genus. The total height of each plant was recorded along with whether or not any browse was available at a height of 2 m or less. Browse material less than 2 m above the ground was considered available to the black rhinos, and browse material higher than 2 m was considered unavailable to the black rhino (Brown, 2008).The available browse of plots that fell within 75% minimum convex polygons, which were later generated using animal locations, was compared to the available browse of those that fell outside of home ranges using a chi-square analysis to determine if the proportions of species of vegetation found within home ranges were significantly different from the vegetation outside of home ranges. The number of plots that fell inside of the home ranges were also compared to all of the sampling plots using a chi-square analysis. Dead plants that were still identifiable were recorded, but excluded from analysis, and a limited number of unknowns were excluded from analysis as well.

Dam Usage

We placed Bushnell camera traps at multiple waterholes throughout the study area to determine the amount of black rhino activity around each site. Motion sensing camera traps were placed at each waterhole at angles that both maximized the area surrounding the waterhole captured in photographs and covered the areas where the greatest amount of animal activity occurred, determined by track density. Cameras were placed at each dam for two week periods, during both the dry and wet seasons. A visit or use of the waterhole was defined as a picture of a black rhinoceros on the camera card.

Figure 2.2: Camera Trap Photograph

Multiple pictures of the same animal within the same fifteen minute period were recorded as a single use. Similarly, if a single animal remained in the same position for a long period of time and it was evident that it was not re-using the waterhole, these data were recorded as a single use. The cameras were equipped with infrared LEDs, so night time activity was also recordable with minimal impact upon the animals.

I then conducted a chi-square analysis using these data to determine if there was a significant difference in the number of uses each waterhole was expected to receive based upon the number of home ranges it fell into compared to the number of uses each actually received. The waterholes were placed into a Microsoft Excel spreadsheet and it was determined how many home ranges each fell into. The number of home ranges was then summed and a proportion of the total was determined. This proportion was then multiplied by the total number of rhino observations at all waterholes to develop an expected value.

Waterhole Characterstics

Visibility Indexes

An average measure of the vegetation density around each waterhole was determined. A total of ten measurements were taken from each waterhole. A single measurement required two technicians. One technician stood at the sampling point, while the second walked a dropstick in a straight line away from the center of the waterhole, placing the dropstick so that one end was on the ground and the other stood at the average shoulder height of a black rhino, until it could no longer be seen by the first technician. The furthest distance that any portion of the dropstick could be seen by the first technician was recorded for each of the ten points, and then those measures were averaged together to create an index of the average visibility surrounding the waterholes. The ten starting points were evenly spaced around the waterholes and the side with the dam wall was excluded when one was present. The dropstick used measured 1.5 meters, the average shoulder height of a black rhinoceros.

Water Quality Testing

I collected one, two-liter sample from each of 11 waterholes throughout the study area. Containers were boiled in water and sealed overnight, only those that remained sealed were used to collect samples. Containers were submerged six inches under the surface, at least one meter from the edge of the waterholes and then opened and re-sealed underwater. The samples were then placed on ice in a cooler and delivered to ENDIP Wildlife Laboratory for analysis. The lab identified the genera of algae present in the waterholes. The lab also determined the pH, electrical conductivity (mS/m), amount of total dissolved solids (mg/L), turbidity (ntu), alkalinity (mg/L), calcium (mg/L), chlorine (mg/L), total hardness (mg/L), and hardness due to calcium (mg/L).

I ran a prinicpal component analysis on the data using SPSS Statistics. Based on the percent of variance explained by each component, shown in table 2.1, only the first two components were extracted.

Component	% of Variance Explained
1	57.966
2	18.541
3	9.393
4	8.095
5	4.838
6	0.641
7	0.351
8	0.159
9	0.017
10	5.78E-15

Table 2.1: Percent of Variance Explained per Component

CHAPTER 3

RESULTS

Animal Locations

Following the collection of locations from A sightings (visuals), B sightings (heard animal but no visual), and C sightings (locations calculated with radio telemetry) 75% minimum convex polygons home ranges were generated for each animal. In a minimum convex polygon home range, the outermost data points representing an animal's locations are connected to form a convex polygon; the outermost 25% are excluded in the formation of a 75% minimum convex polygon (Kie et al., 1996). The results can be seen in the figure 3.1 and table 3.1.

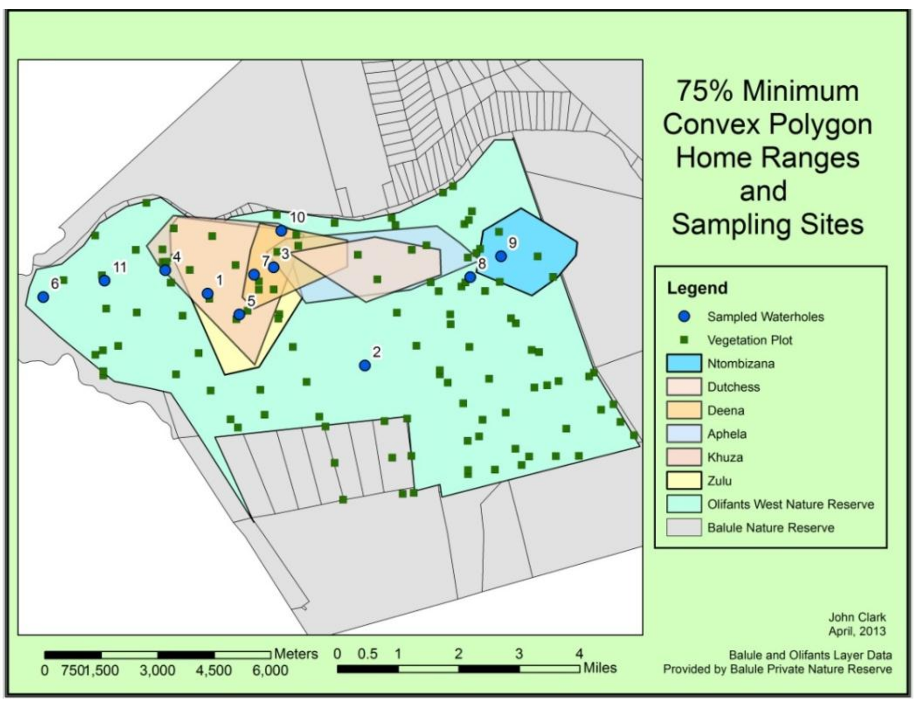


Figure 3.1: 75% Minimum Convex Polygon Home Ranges and Sampling Sites

Rhino	Aphela	Deena	Duchess	Khuza	Ntombizana	Zulu
Sex	Male	Female	Female	Female	Female	Male
A sightings	22	22	15	36	9	27
B Sightings	6	6	3	1	3	2
C sightings	15	16	6	6	15	1
Total Locations	43	44	24	43	27	30
Home Range Size (ha)	757.8	398.2	414.3	919.9	399.3	981.4
Range FOverlap	3 M 1 F	2 M 2 F	1 M 2 F	2 M 2 f\F	None	1 M 2 F
IAge During GStudy (Yrs)	5	4	6	4	3	7

Table 3.1: 75% Minimum Convex Polygon Home Range Results

The average home range size is 645.2 hectares. When the overlap was excluded, the home ranges of these six animals were found to cover a total of 2,215.2 hectares.

Vegetation Availability

A total of 1746 plants with browse material available to black rhinos were recorded. I recorded each plant to the species level when possible, and if this was not possible I recorded at least to the genus level. Of these 763 were found in 47 plots that fell within the 75% minimum convex polygonal home ranges and 983 were recorded in the 75 plots that fell outside of the home ranges. A total of 122 plots were sampled. When the 47 plots that fell within home ranges were compared to all 122 of the surveyed plots, to compare vegetation within home ranges to that randomly available across the landscape, I found a chi-square value of 698.18. With 31 degrees of freedom the p value is less than 0.001. When I compared the 47 plots that fell within home ranges to the 75 plots outside of home ranges the chi-square value was found to be 778.54. With 31 degrees of freedom the p-value is less than 0.001. This indicates a statistically significant difference between both the vegetation randomly available across the landscape compared to the vegetation within the established home ranges and the vegetation available within home ranges compared to the vegetation available outside of home ranges.

Forage Data

Initially, a total of 4758 bites were recorded. I recorded each plant browsed to the species level when possible, and if this was not possible I recorded at least to the genus level. However, 229 bites recorded on forbs and three bites recorded on grasses were excluded from the analysis. This was necessary due to the inability of backtracking to accurately estimate the amount of feeding on forbs and grasses. Feeding on forbs and grasses is easily missed, so the collected data were excluded to prevent inaccurate results (Buk and Knight, 2004). Once the unusable data were discarded, a total of 4526 bites from 30 groups remained for the final analysis.

I also extracted data to test for a preference in feeding height for the black rhino. Only feeding on plants in the *Grewia* genus that were at least two meters tall was considered. This allowed for availability to be taken into account due to the plants shrubby growth habit, any plant that was at least two meters tall could be assumed to have vegetation available to the rhinos throughout all height classes in which the black rhino can feed. There were 1361 bites that could be analyzed in this fashion; 33 in the height range of 0-0.5 meters; 474 in the height range of 0.51-1.0 meters; 701 in the height range of 1.01-1.5 meters; and 153 in the height range of 1.51-2.0 meters. A chi-square value of 815.6 was determined, indicating that the bites are unevenly distributed with three degrees of freedom and a p value greater than 0.001. The two most preferred height classes were 0.51-1.0 meters which contained 34.8% of all bites and 1.01-1.5 meters which contained 51.5% of all bites.

Principal taxa were defined as those that comprised >=5% of the total number of bites (Winkle, 2004). The *Boscia spp* group, excluding *Boscia albitrunca* which could be easily identified, comprised 5.34% of the total diet and had an electivity index of 0.70 (*Boscia albitrunca* comprised 0.57% of rhino diet and had an electivity index of 0.08). *Euclea divinorum* comprised 20.53% of the total diet and had an electivity index of 0.99, while the remainder of the *Euclea spp* taxa comprised an additional 6.96% of total diet and possessed an electivity index of 0.92. *Euclea divinorum* is easily recognizable so I was able to identify it to the species level and analyze it separately. The *Euphorbia* genus comprised 7.6% of the total diet and had an electivity index that approached 1.0; no members of this genus were found in the vegetation availability sampling plots but it is known to be locally present. The *Grewia* genus comprised 42.71% of total diet, contributing by far the largest amount to rhino diet and had an electivity index of -0.07; this negative value indicates that slightly less of the *Grewia* genus was eaten than was assumed based upon its availability. These five principal taxa comprised a total of 83.14% of the total of the black rhinos in this study. The values for each are shown in table 3.2.

Principal Taxa	Percent of Diet	Percent of Available Plants	Electivity Index
Grewia spp	42.71	49.41	-0.07
Euclea divinorum	20.53	0.13	0.99
Euphorbia spp	7.60	0.00	Approaches 1.00
Euclea spp	6.96	0.26	0.93
Boscia spp	5.35	3.15	0.26
Totals	83.14	52.95	

Table 3.2: Principal Taxa

Preferred species were determined using the electivity index described above and in Winkle (2004). Those taxa with electivity indexes over 0.4 and comprising at least 1% of total measured diet are reported in the text here, and the remainder can be found in appendix G. *Dombeya cymosa* had an electivity index of 0.84 and comprised 2.96% of rhino diet. *Euclea divinorum* had an index of 0.99 and comprised 20.53% of diet, while the remainder of the *Euclea* genus had a total electivity index of 0.93 and comprised 6.96% of total diet. The *Ozoroa* genus had an electivity index of 0.48 and comprised 1.88% of total diet. *Schotia brachypetela* had an electivity index of 0.64 and comprised 1.19% of total diet. The values for preferred taxa are shown in table 3.3.

Preferred Taxa	Percent of Total Diet	Percent of Total Plants Available	Electivity Index
Dombeya cymosa	2.96	0.26	0.84
Euclea divinorum	20.53	0.13	0.99
Euclea spp	6.96	0.26	0.93
Euphorbia spp	7.60	0.00	Approaches 1.00
Ozoroa spp	1.88	0.66	0.48
Schotia brachypetela	1.19	0.26	0.64

Table 3.3: Preferred Taxa

Dam Usage

During the two week sampling periods the rhinos utilized the sampled waterholes a total of 45 times. The number of rhinoceros uses, number of home ranges each falls into, and expected number of uses for each waterhole are shown in table 3.4.

Waterhole	Number of home ranges within	Observed visits	Proportion of Home ranges (15/ number of HR within)	Expected Visits
1	2	0	0.13	6
2	0	2	0.00	0
3	3	5	0.20	9
4	1	0	0.07	3
5	2	1	0.13	6
6	0	2	0.00	0
7	3	2	0.20	9
8	0	12	0.00	0
9	1	8	0.07	3
10	3	11	0.20	9
11	0	2	0.00	0
	15	45	1.00	45

Table 3.4: Waterhole Uses, Home Range Overlap, and Expected Uses

In the cases where zero visits were expected, a value of 0.1 was submitted as a place holder so that the equation could be submitted. A chi-square statistic of 1553.6 was calculated. With the ten degrees of freedom present for this test the p value was less than 0.001, indicating a statistical difference between the number of uses expected for each waterhole and the number of uses each waterhole actually received.

Waterhole Characteristics

The normality of the visibility index data for all waterholes was tested using the Shapiro-Wilk test and was found to have a p value of 0.001, causing a rejection of the null hypothesis of a normal distribution. Each variable analyzed in the water quality tests was tested for normality using the Shapiro-Wilk test and the null hypothesis of a normal distribution was rejected for the pH and turbidity values. The remainder of the distributions were determined to be normally distribution.

The mean and standard deviation for each variable tested across all sampling sites are shown in table 3.5.

Variable	Mean	Std. Deviation	Analysis N
Alk	323.27	94.00	11
Ca	20.19	8.66	11
CaH	50.36	21.59	11
Cl	129.64	83.21	11
EC	131.42	50.87	11
Ph	8.02	0.29	11
TDS	583.27	236.01	11
TH	269.45	87.38	11
Turb	19.45	23.43	11
Visibility	28.85	13.64	11

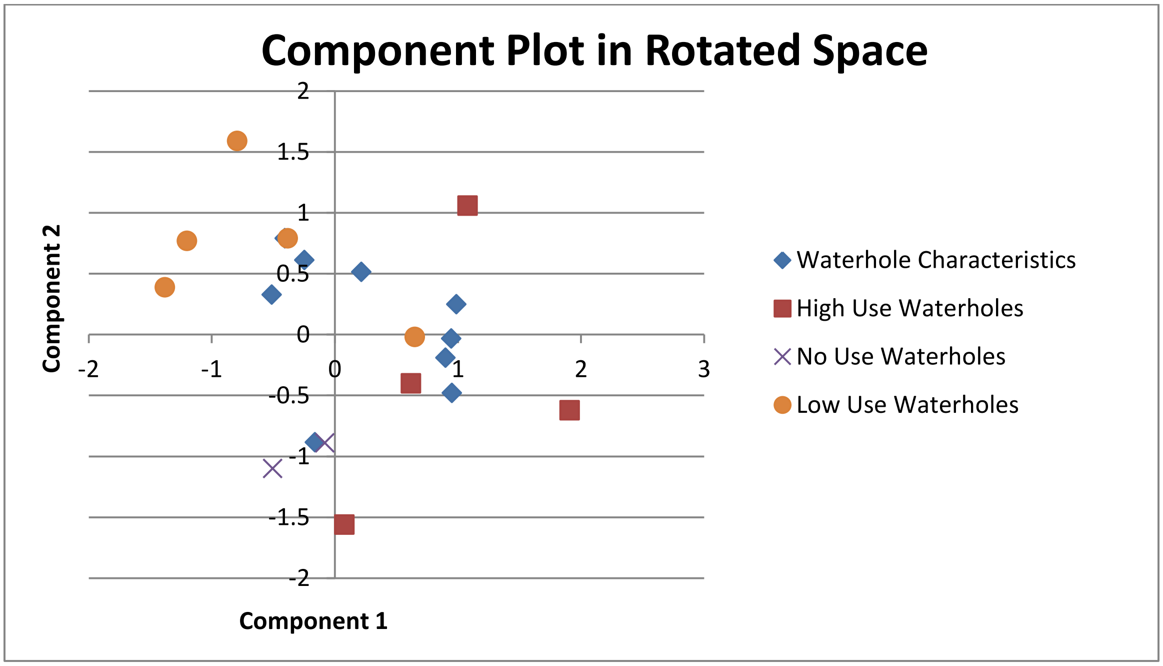
Table 3.5: Descriptive Statistics of Waterhole Characteristics

The ten initial principal components generated by the test and the amount of variance that each represents can be seen in table 3.6. Based on these values only the first two components were extracted for the final graphical analysis.

Component	% of Variance Explained
1	57.966
2	18.541
3	9.393
4	8.095
5	4.838
6	0.641
7	0.351
8	0.159
9	0.017
10	5.78E-15

Table 3.6: Principal Component Analysis, Percent of Variance Explained by Component

The graph in figure 3.2 shows the degree to which each component is able to align with the variables. A factor score was also generated for each waterhole and the waterholes were placed on figure 3.2 as well. The values for each variable can be seen in table 3.7, the factor scores for each waterhole are shown in table 3.8, and a map of sampling sites overlaid on the 75% minimum convex polygon home ranges is shown in appendix A. For the graph, waterholes with 1-4 uses during the study period were classed as low use and those with greater than five visits were classed as high use waterholes. Two waterholes were not visited by any of the study animals during the observation period and upon mapping both were within the 75% minimum convex polygon home ranges. Five waterholes were classed as low use, and two of these were within the 75% minimum convex polygon home ranges. Four waterholes were classed as high use and three of these were within the 75% minimum convex polygon home ranges. A map of sampling sites and the 75% minimum convex polygon home ranges is in appendix A.



Waterhole Characteristics, N=10
No use = zero visits, N=2
Low use = 4 visits or less, N=5
High use= 5 visits or more, N=4

Figure 3.2: Component Plot in Rotated Space

Variable	Component 1	Component 2
Cl	0.99	0.249
EC	0.953	-0.48
TDS	0.948	-0.033
TH	0.9	-0.189
Turb	-0.51	0.328
Alk	-0.16	-0.885
CaH	-0.405	0.791
Ca	-0.405	0.79
Visibility	-0.245	0.612
pH	0.216	0.516

Table 3.7: Component Plot Value

Waterhole	Component 1 Score	Component 2 Score	Within 75% Home Ranges?	Number of Rhino Visits
Waterhole 1	-0.503	-1.1	Yes	0
Waterhole 2	-0.791	1.59	No	2
Waterhole 3	1.91	-0.62	Yes	5
Waterhole 4	-0.08	-0.89	Yes	0
Waterhole 5	-1.2	0.77	Yes	1
Waterhole 6	-1.38	0.39	No	2
Waterhole 7	0.65	-0.02	Yes	2
Waterhole 8	0.08	-1.56	No	12
Waterhole 9	0.62	-0.4	Yes	8
Waterhole 10	1.08	1.06	Yes	11
Waterhole 11	-0.38	0.79	No	2

Table 3.8: Waterhole Component Plot Values

CHAPTER 4

DISCUSSION

The principal taxa, those that compose at least 5% of the total measured woody diet, along with their percentage of the total plants available to the black rhinos and their electivity indexes are shown in table 3.2.

The *Grewia* genus comprised by far the largest portion of the study animals' diets. The slightly negative index indicates that less *Grewia* was consumed than was expected based upon its availability within home ranges. While the electivity values have not been statistically analyzed, this low deviation from the expected consumption does not appear to be significant. The animals are most likely consuming this genus heavily because it is so readily available within their home ranges (49% of total plants).

Euclea divinorum, *Euphorbia spp*, and *Ecluea spp* each have very high electivity indexes. These high values indicate that the study animals were actively seeking out these particular taxa, rather than simply eating what was randomly available across their home ranges, as is the case with the *Grewia* genus. The electivity index approaching 1.0 for the *Euphorbia* genus occurred because no members of that genus were encountered during the vegetation sampling and indicates a strong preference for the taxa. While *Boscia spp* does have a positive electivity index which indicates selection for this taxa, the value does not show that this species is as highly sought after as other taxa with higher indexes.

Euclea divinorum and *Boscia albitrunca* were evaluated separately from the remainder of their respective genera because each is easily identifiableable in the field.

Table 3.3 shows the preferred browse taxa, those that accounted for at least 1% of total diet and possessed an electivity index of 0.4. Three of the highly preferred taxa also appear in the principal taxa and were discussed above. However, *Dombeya cymosa*, *Ozoroa spp*, and *Schotia brachypetela* are also preferred taxa. While these groups do not comprise large percentages of the black rhino diet, they are each actively selected for by the black rhino.

That several taxa are defined as both principal (>=5% of measured diet) and preferred (electivity indexes over 0.4 and at least 1% of total measured diet) taxa, along with the significant difference between the vegetation available to the rhinos within home ranges and the vegetation that would be available outside of home ranges indicates that a differential use of home ranges is indeed occurring as was hypothesized. The differential habitat use can also be seen in the amount of overlap that occurs in the 75% home ranges, indicating that the rhinos are potentially grouping around specific resources. The average size of the calculated home ranges was 645.2 hectares. If no overlap had occurred the ranges would have covered 3,807.9; however, the large amount of overlap shown in appendix A reduced the total area utilized by the rhinos on a regular basis to 2,215.2 hectares, a mere 5.8% of the 37,977 ha reintroduction area. Five of the animals shared area with at least two other animals, while one individual had no overlap at all.

Both the presence of multiple taxa within the principal and preferred forage groups and the large amount of overlap seen in the home ranges in appendix A support the conclusion that the rhinos are utilizing the habitat differentially across the landscape. Due to this differential habitat use, the carrying capacity of 75 animals estimated by Ferguson (2011) is likely an overestimate of the actual carrying capacity of the reintroduction area. This overestimate most likely occurred because the estimation viewed the reserve as one homogenous area and did not take into account the vegetation differences that are reported in this study. Because the actual carrying capacity for the area is likely to be lower than estimated, the goal to maintain a six to seven percent off-take per year may be unsustainable and require amending.

Once the factor values for each waterhole were projected onto the component plot in rotated space, no apparent groupings were highly noticeable. This indicates that none of the variables tested are highly useful in predicting which waterholes will be used the most by black rhinos, and that water quality may have little to no effect on rhinoceros habitat selection. However, factors other than those measured in this study may affect rhinoceros use of waterholes and should be considered in future studies. Factors such as the vegetation composition surrounding waterholes may serve as indicators of which waterholes black rhinos will use. Further research could potentially benefit from a larger sample size and an increase in the amount of time each waterhole is monitored for rhino activity.

WORKS CITED

Adcock, K., & Emslie, R. (2007). Monitoring african rhino trainee's guide. SADC Regional Programme for Rhino Conservation,

Berger, J. (1994). Science, conservation, and black rhinos. *Journal of Mammology*, *75*(2), 298-308. Retrieved from http://www.jstor.org/stable/1382548

Berger, J., Cunningham, C., & Gawuseb, A. (1994). The uncertainty of data and dehorning black rhinos. *Conservation Biology*, *8*(4), 1149-1152. Retrieved from http://www.jstor.org/stable/2386586

Berger, J., C. Cunningham, A. Gawuseb, and M. Lindeque. (1993). “Costs” and short-term survivorship of hornless black rhinos. Conservation Biology, 7, 920-924.

Berger, J., & Cunningham, C. (1998).Natural variation in horn size and social dominance and their importance to the conservation of black rhinoceros. *Conservation Biology*, *12*(3), 708-711.

Biggs, D., Frank, C., Rowan, M., & Hugh, P. (2013).Legal trade of Africa's rhino horns. *Science*, *339*, 1038-1039. doi: 10.1126/science.1229998

Black rhino-Diceros bicornis. Retrieved from http://www.rhinoresourcecenter.com/species/black-rhino/

Brown, D. H. (2008). The Feeding Ecology of the black rhinoceros (*Diceros bicornis minor*) in the Great Fish River Reserve, Eastern Cape Province, South Africa. *Agriculture*.

Buk, K.G. (2004).Diet Selection Of And Habitat Suitability For Black Rhino In Augrabies Falls National Park, South Africa. (Master’s thesis, University of Copenhagen).

Buk, K. G., & Knight, M. H. (2010). Seasonal diet preferences of black rhinoceros in three arid south african national parks. *African Journal of Ecology, 48*(*4*), 1064-1075

Conniff, R. (2011). Defending the rhino. *Smithsonian Magazine*, Retrieved from http://www.smithsonianmag.com/science-nature/Defending-the-Rhino.html

Dinerstein, D. E. (2011). *Handbook of the mammals of the world*. (Vol. 2).Lynx Edicions. Retrieved from http://www.lynxeds.com/hmw/family-text/hmw-2-family-text-rhinocerotidae-rhinoceroses

Emslie, H.R. & K. Adcock. (1994). Feeding ecology of the black rhinoceros. Pp. 65-81. *In:* Penz-horn, B.L. & N.P.L. Kriek (eds.). *Proceedings of symposium on rhinos as game ranching Animals.Ondersteport. 9-10 September 1994.* Wildlife Group on the South African

Association. Republic of South Africa.

Emslie, H. R. (2012). *Diceros bicornis*. In: IUCN 2012. IUCN Red List of Threatened Species. Version 2012.2. <www.iucnredlist.org>. Downloaded on 25 February 2013.

Ferguson, C. (2011). BNR Nature Reserve Black Rhino Management Plan. Private report.

Göttert T. (2011). On the acclimatisation of African rhinoceros after reintroduction to former livestock farmland in Namibia. Dissertation. University of Göttingen.

Hillman-Smith, AK, CP Groves. (1994). *Diceros bicornis*. Mammalian Species Account No. 455. American Society of Mammalogists. Lawrence, Kansas.

Huang, S. (2013).Alternatives to rhino horn.*The Journal of Chinese Medicine*, Retrieved from http://www.jcm.co.uk/endangered-species-campaign/rhinoceros/alternatives-to-rhino-horn/

IUCN 2012. IUCN Red List of Threatened Species.Version 2012.2.<www.iucnredlist.org>. Downloaded on 25 February 2013.

Izzedin, F. (1983). Yemen acts to halt rhino horn daggers; scientific tests fail to show rhino horn effective as medicine. *Environmentalist*, *3*(2), 153.

Matipano, G. (2003). A comparison of woody browse selection by hand-raised, boma-adapted and wild black rhinoceros, Diceros bicornis, L. Matusadona National Park, Zimbabwe. *Koedoe, 46*(*2*): 83-96. Pretoria. ISSN 0075-6458.

Kie, J. G., Baldwin, J. A., & Evans, C. J. (1996). Calhome: A program for estimating animal home ranges. *Wildlife Society Bulletin*, *24*(*2*), 342-344. Retrieved from http://www.jstor.org/stable/3783132

McGrath, M. (2013). Rhino horn--time to legalise the trade say researchers. *BBC News*. Retrieved from http://www.bbc.co.uk/news/science-environment-21615280

Mucina, L. & Rutherford, M.C. (2006). The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19: 348-437.

Van Lieverloo, R.J. and Schuiling, B.F. (2004). *The diet profile of the black rhinoceros: comparison of faecal analysis with backtracking in the Great Fish River Reserve, South Africa*. MSc. thesis.Tropical Resources Ecology, Wageningen University, Netherlands.

Oloo, Timothy, Robert Brett, and Truman, Young. (1994). "Seasonal Variation in the Feeding Ecology of black rhinoceros (Diceros bicornis) in Laikipia, Kenya."*African Journal of Ecology*, *32*, 142-157. Web. 28 Feb. 2012. Retrieved from <http://www.rhinoresourcecenter.com/pdf_files/124/1246006556.pdf>.

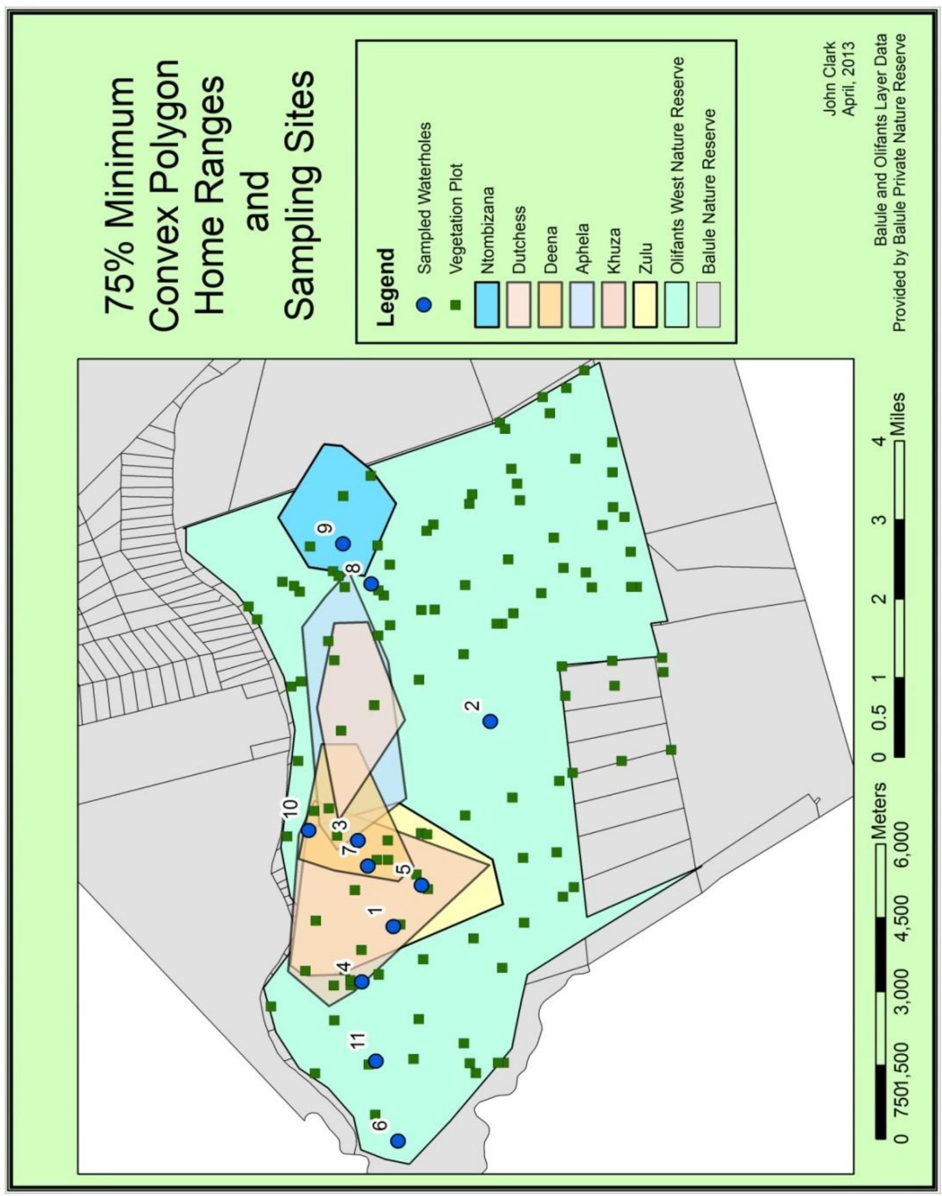
Petrides, G.A. (1975). Principle foods versus preferred foods and their relations to stocking rate and range conditions. *Biol. Conserv. 7*, 161-169

Republic of South Africa, Department of Environmental Affairs, (2013).*Update on the rhino poaching statistics*. Retrieved from website: http://www.info.gov.za/speech/DynamicAction?pageid=461&sid=34092&tid=98004

Rhino Resource Center.(n.d.).*Black rhino--diceros bicornis*. Retrieved May, 2013 from http://www.rhinoresourcecenter.com/species/black-rhino/

Winkel, F. (2004). Diet choice of the black rhinoceros (*Diceros bicornis*) in the Double Drift Game Reserve, Eastern Cape Province, South Africa. *Resource Ecology Group.*

APPENDIX A



- Waterhole numbers correspond to waterholes in tables 3.4 and 3.9

APPENDIX B

Raw Telemetry Data

Date	Rhino	Type	Time	Mobi-lity	Fee-ding	Lat.	Long.	Bear-ing	AoS	El	Tech
6/25	Deena	C	12:58	Ukn	Ukn	-24.18710	30.91200	300	30	425	JC & RB
6/25	Deena	C	12:48	Ukn	Ukn	-24.18090	30.91244	270	25	408	JC & RB
6/25	Ntom	C	14:40	Ukn	Ukn	-24.18273	30.93689	125	30		JC & RB
6/25	Dutch	C	12:13	Ukn	Ukn	-24.18582	30.92465	290	20	424	JC & RB
6/25	Ntom	C	14:33	Ukn	Ukn	-24.18699	30.93696	90	40		JC & RB
6/25	Dutch	C	12:55	Ukn	Ukn	-24.18710	30.91199	320	50	425	JC & RB
6/25	Aphela	C	10:57	Ukn	Ukn	-24.19266	30.92937	300	15	443	JC & RB
6/25	Deena	C	12:04	Ukn	Ukn	-24.19266	30.92937	310	30	443	JC & RB
6/25	Aphela	B	11:45	Ukn	Ukn	-24.19165	30.92263	N/A	N/A	431	RB & SB
6/25	Lima	A	14:30	Yes	Yes	-24.18721	30.93731	N/A	N/A	413	Vehicle
6/27	Zulu	B	12:05	Ukn	Ukn	-24.19305	30.89441	N/A	N/A	382	JC & SB
6/27	Khuza	A	11:04	dist	No	-24.17320	30.86202	N/A	N/A	373	JC & SB
6/27	Aphela	A	13:14	No	No	-24.18192	30.93163	N/A	N/A	429	JC & SB
6/27	Khuza	C	10:39	Ukn	Ukn	-24.18523	30.86217	18	25	421	RB & JC
6/27	Khuza	C	10:56	Ukn	Ukn	-24.17288	30.86384	282	45	368	RB & JC
6/27	Zolisa	C	14:48	Ukn	Ukn	-24.17622	30.94545	133	25	419	RB & JC
6/27	Dutch	C	13:36	Ukn	Ukn	-24.18082	30.94333	125	50	431	RB & JC
6/27	Zolisa	C	13:39	Ukn	Ukn	-24.18082	30.94333	97	25	431	RB & JC
6/27	Dutch	C	11:42	Ukn	Ukn	-24.18199	30.89503	85	30	416	RB & JC
6/27	Zulu	C	11:34	Ukn	Ukn	-24.18200	30.89503	200	20	416	RB & JC
6/27	Dutch	C	12:49	Ukn	Ukn	-24.18250	30.93684	115	30	437	RB & JC
6/27	Zolisa	C	14:22	Ukn	Ukn	-24.18584	30.95043	67	25	430	RB & JC
6/27	Dutch	A	13:57	Yes	No	-24.18314	30.94867	N/A	N/A	413	Vehicle
6/29	Zulu	C	11:18	Ukn	Ukn	-24.18716	30.89005	8	35	410	JC & RB
6/29	Zulu	C	11:32	Ukn	Ukn	-24.17899	30.88824	210	10	374	JC & RB
6/29	Aphela	A	13:35	No	No	-24.16754	30.94483	N/A	N/A	385	JC & SB

6/29	Zulu	A	12:10	Yes	Yes	-24.18362	30.88658	N/A	N/A	393	RB & SB
6/29	Khuza	A	10:18	dist	No	-24.18012	30.85381	N/A	N/A	413	Vehicle
7/3	Aphela	A	10:45	Yes	No	-24.18582	30.93823	N/A	N/A		JC & SB
7/3	Ntom	B	13:00	Ukn	Ukn	-24.18096	30.95086	N/A	N/A		JC & SB
7/3	Deena	C	10:18	Ukn	Ukn	-24.22676	30.86833	20	30		RB & JC
7/3	Ntom	C	10:12	Ukn	Ukn	-24.22676	30.86833	48	35		RB & JC
7/3	Ntom	C	11:08	Ukn	Ukn	-24.17067	30.93953	175	30		RB & JC
7/3	Deena	C	11:25	Ukn	Ukn	-24.17349	30.94066	260	40		RB & JC
7/3	Ntom	C	12:02	Ukn	Ukn	-24.18082	30.94330	103	35		RB & JC
7/3	Deena	A	11:47	dist	No	-24.17471	30.93469	N/A	N/A		SB & RB
7/3	Zulu	A	14:45	Yes	Yes	-24.19674	30.82764	N/A	N/A		Vehicle
7/3	Lima	A	12:28	Yes	No	-24.18465	30.94677	N/A	N/A		Vehicle
7/7	Aphela	A	10:30	No	No	-24.18973	30.94640	N/A	N/A		JC & SB
7/7	Zulu	C	14:56	Ukn	Ukn	-24.18367	30.39173	45	30		RB & JC
7/7	Zulu	C	14:39	Ukn	Ukn	-24.19437	30.86755	77	15	441	RB & JC
7/7	Khuza	C	13:15	Ukn	Ukn	-24.20042	30.85429	18	35		RB & JC
7/7	Zulu	C	13:12	Ukn	Ukn	-24.20042	30.85429	80	40	509	RB & JC
7/7	Deena	C	8:52	Ukn	Ukn	-24.18584	30.95043	257	35		RB & JC
7/7	Lima	C	9:01	Ukn	Ukn	-24.18584	30.95043	212			RB & JC
7/7	Zolisa	C	8:45	Ukn	Ukn	-24.18584	30.95043	163	25		RB & JC
7/7	Khuza	C	13:53	Ukn	Ukn	-24.17146	30.85630	128	35	370	RB & JC
7/7	Deena	C	11:13	Ukn	Ukn	-24.17747	30.93639	275	30	411	RB & JC
7/7	Lima	A	10:50	yes	no	-24.18799	30.94009	N/A	N/A	420	Vehicle
7/7	Khuza	A	14:18	No	No	-24.17292	30.86092	N/A	N/A	375	Vehicle
7/7	Dutch	A	12:00	No	No	-24.18553	30.92824	N/A	N/A		Vehicle
7/14	Lima	B	9:20	Ukn	Ukn	-24.17768	30.94178	N/A	N/A		JC & SB
7/14	Ntom	A	9:20	No	No	-24.17768	30.94178	N/A	N/A		JC & SB
7/14	Deena	B	10:45	Ukn	Ukn	-24.17932	30.92721	N/A	N/A	415	JC & SB
7/14	Aphela	A		No	No	-24.17947	30.91342				SB & RB
7/14	Dutch	B		Ukn	Ukn	-24.18258	30.91337	N/A	N/A	395	SB & RB

7/16	Aphela	C	12:03	Ukn	Ukn	-24.17234	30.09519	185	20	446	RB & JC
7/16	Lima	C	12:14	Ukn	Ukn	-24.17234	30.95187	230	30	446	RB & JC
7/16	Dutch	C	11:12	Ukn	Ukn	-24.18150	30.89462	315	20	406	RB & JC
7/16	Aphela	C	13:05	Ukn	Ukn	-24.19729	30.94723	23	35	456	RB & JC
7/16	Lima	C	13:12	Ukn	Ukn	-24.19729	30.94723	300	40	456	RB & JC
7/16	Dutch	C	10:43	Ukn	Ukn	-24.20040	30.85423	85	20	485	RB & JC
7/23	Aphela	C	9:59	Ukn	Ukn	-24.17235	30.95190	183	25		JC
7/23	Aphela	C	10:41	Ukn	Ukn	-24.17819	30.94326	200	30		JC
7/23	Aphela	C	11:10	Ukn	Ukn	-24.18255	30.93690	120	40		JC
7/23	Lima	C	11:20	Ukn	Ukn	-24.18255	30.93690	255	50		JC
7/23	Aphela	C	11:37	Ukn	Ukn	-24.18537	30.93420	133	25		JC
7/23	Lima	C	11:57	Ukn	Ukn	-24.18559	30.93446	245	30		JC
7/23	Aphela	C	13:41	Ukn	Ukn	-24.21310	30.96413	328	25		JC
7/23	Lima	C	13:54	Ukn	Ukn	-24.21310	30.96413	325	30		JC
7/23	Lima	C	14:06	Ukn	Ukn	-24.21630	30.94987	338	25		JC
7/23	Lima	C	14:18	Ukn	Ukn	-24.21921	30.93721	25	30		JC
7/24	Dutch	C	10:31	Ukn	Ukn	-24.17921	30.92108	205	40	417	JC
7/24	Deena	C	13:35	Ukn	Ukn	-24.18144	30.89450	98	35	396	JC
7/24	Khuza	A	13:11	Yes	Yes	-24.18183	30.86014	N/A	N/A	387	JC
7/24	Zulu	A	13:11	Yes	Yes	-24.18183	30.86014	N/A	N/A	387	JC
7/24	Dutch	C	10:13	Ukn	Ukn	-24.18251	30.92806	260	20	413	JC
7/24	Deena	C	13:30	Ukn	Ukn	-24.18743	30.88900	60	30	423	JC
7/24	Deena	C	11:31	Ukn	Ukn	-24.19152	30.86966	90	30	454	JC
7/24	Dutch	C	10:01	Ukn	Ukn	-24.18246	30.93687	285	30	428	JC
7/24	Aphela	B	9:31	Ukn	Ukn	-24.18399	30.94998	N/A	N/A	424	JC & SB
7/24	Lima	A	9:38	No	No	-24.18202	30.94856	N/A	N/A	409	Vehicle
7/29	Deena	A	14:00	Yes	Yes	-24.18488	30.89760	N/A	N/A	366	JC & SB
7/29	Dutch	A	10:39	Yes	No	-24.18814	30.93060	N/A	N/A	435	JC & SB
7/29	Khuza	C	9:04	Ukn	Ukn	-24.18270	30.88083	235	30		RB & JC
7/29	Zoliswe	C	15:04	Ukn	Ukn	-24.18274	30.88083	140	20		RB & JC
7/29	Zoliswe	C	14:52	Ukn	Ukn	-24.19202	30.96077	85	20	402	RB & JC
7/29	Khuza	C	12:55	Ukn	Ukn	-24.20048	30.85429	38	25	509	RB & JC
7/29	Ntom	A	11:40	Yes	Yes	-24.17924	30.92770	N/A	N/A	422	SB & RB
7/29	Lima	A	11:40	Yes	Yes	-24.17924	30.92770	N/A	N/A	422	SB & RB
7/30	Khuza	C	8:47	Ukn	Ukn	-24.17230	30.95187	275	30	449	JC & RB

7/30	Ntom	C	8:45	Ukn	Ukn	-24.17230	30.95187	173	25	449	JC & RB
7/30	Khuza	C	10:03	Ukn	Ukn	-24.17963	30.92077	315	20	431	JC & RB
7/30	Khuza	C	12:29	Ukn	Ukn	-24.18198	30.89499	335	20	412	JC & RB
7/30	Ntom	C	11:06	Ukn	Ukn	-24.18410	30.94674	95	30	441	JC & RB
7/30	Aphela	B	13:10	Ukn	Ukn	-24.19438	30.89515	N/A	N/A	386	RB & SB
7/30	Deena	A	14:10	Yes	Yes	-24.17749	30.88777	N/A	N/A	375	SB
8/1	Deena	C	14:36	Ukn	Ukn	-24.17238	30.95192	288	25	445	JC & RB
8/1	Dutch	C	14:31	Ukn	Ukn	-24.17238	30.95192	280	30	445	JC & RB
8/1	Lima	C	14:29	Ukn	Ukn	-24.17238	30.95192	230	20	445	JC & RB
8/1	Ntom	C	14:27	Ukn	Ukn	-24.17238	30.95192	120	20	445	JC & RB
8/1	Zoliswe	C	14:21	Ukn	Ukn	-24.17238	30.95192	195	30	445	JC & RB
8/1	Deena	C	12:27	Ukn	Ukn	-24.18156	30.89464	60	20	406	JC & RB
8/1	Dutch	C	12:20	Ukn	Ukn	-24.18156	30.89464	90	20	406	JC & RB
8/1	Ntom	C	14:05	Ukn	Ukn	-24.19252	30.96165	20	30	408	JC & RB
8/1	Zoliswe	C	14:01	Ukn	Ukn	-24.19252	30.96165	275	10	408	JC & RB
8/1	Dutch	C	11:55	Ukn	Ukn	-24.19702	30.86710	88	35	451	JC & RB
8/1	Lima	C	11:58	Ukn	Ukn	-24.19702	30.86710	80		451	JC & RB
8/1	Lima	C	13:27	Ukn	Ukn	-24.19716	30.94700	275	30	453	JC & RB
8/1	Ntom	C	13:30	Ukn	Ukn	-24.19716	30.94700	90	30	453	JC & RB
8/1	Zoliswe	C	13:33	Ukn	Ukn	-24.19716	30.94700	68	35	453	JC & RB
8/1	Dutch	C	11:12	Ukn	Ukn	-24.20053	30.85427	83	15	511	JC & RB
8/1	Dutch	C	12:48	Ukn	Ukn	-24.21352	30.89491	40	30	433	JC & RB
8/1	Lima	C	12:51	Ukn	Ukn	-24.21352	30.89491	70	30	433	JC & RB
8/2	Khuza	C	9:34	Ukn	Ukn	-24.17135	30.85996	120	20	357	JC & RB
8/2	Dutch	C	12:57	Ukn	Ukn	-24.17159	30.93700	220	40	400	JC &RB
8/2	Uphi	C	13:06	Ukn	Ukn	-24.17159	30.93700	0	30	400	JC & RB
8/2	Deena	C	11:56	Ukn	Ukn	-24.17237	30.95193	250	30	451	JC & RB
8/2	Dutch	C	11:58	Ukn	Ukn	-24.17237	30.95193	255	30	451	JC & RB
8/2	Khuza	C	12:02	Ukn	Ukn	-24.17237	30.95193	265	20	451	JC & RB
8/2	Ntom	C	12:04	Ukn	Ukn	-24.17237	30.95193	120	30	451	JC & RB
8/2	Seun	C	12:07	Ukn	Ukn	-24.17237	30.95193	43	25	451	JC & RB
8/2	Thoko	C	12:11	Ukn	Ukn	-24.17237	30.95193	225	30	451	JC & RB
8/2	Uphi	C	12:12	Ukn	Ukn	-24.17237	30.95193	0	30	451	JC & RB
8/2	Khuza	C	9:15	Ukn	Ukn	-24.17671	30.86213	105	10	430	JC & RB
8/2	Khuza	C	13:54	Ukn	Ukn	-24.17810	30.92046	318	25	408	JC & RB
8/2	Aphela	C	12:39	Ukn	Ukn	-24.18235	30.93677	265	10	436	JC & RB
8/2	Deena	C	10:23	Ukn	Ukn	-24.18480	30.89457	80	20	390	JC & RB
8/2	Aphela	C	13:24	Ukn	Ukn	-24.19235	30.92940	328	25	444	JC & RB
8/2	Dutch	C	13:28	Ukn	Ukn	-24.19235	30.92940	330	20	444	JC & RB

8/2	Khuza	C	17:15	Ukn	Ukn	-24.20048	30.85413	358	35	507	JC & RB
8/2	Deena	C	8:15	Ukn	Ukn	-24.20055	30.85426	80	20	485	JC & RB
8/2	Khuza	C	8:20	Ukn	Ukn	-24.20055	30.85426	60	20	485	JC & RB
8/2	Thoko	C	8:27	Ukn	Ukn	-24.20055	30.85426	130	30	485	JC & RB
8/2	Uphi	C	8:29	Ukn	Ukn	-24.20055	30.85426	50	20	485	JC & RB
8/2	Thoko	C	8:49	Ukn	Ukn	-24.20993	30.87227	170	30	445	JC & RB
8/3	Thoko	C	9:03	Ukn	Ukn	-24.17233	30.95188	205	30	441	JC & RB
8/3	Uphi	C	8:50	Ukn	Ukn	-24.17233	30.95188	340	30	441	JC & RB
8/3	Thoko	C	10:06	Ukn	Ukn	-24.18901	30.92708	228	25	442	JC &RB
8/3	Uphi	C	10:08	Ukn	Ukn	-24.18901	30.92708	10	30	442	JC & RB
8/3	Dutch	A	13:18	dist	No	-24.18274	30.94685	N/A	N/A	407	SB & JC
8/3	Khuza	A	15:20	Yes	No	-24.18715	30.88631	N/A	N/A	388	SB & JC
8/3	Aphela	A	12:48	Yes	No	-24.19106	30.94572	N/A	N/A	431	Vehicle
8/5	Xena	C	11:11	Ukn	Ukn	-24.17155	30.93694	90	20	407	JC & RB
8/5	Ntom	C	9:02	Ukn	Ukn	-24.17236	30.95190	150	40	444	JC & RB
8/5	Xena	C	9:12	Ukn	Ukn	-24.17236	30.95190	85	30	444	JC & RB
8/5	Aphela	C	13:33	Ukn	Ukn	-24.17601	30.88862	118	25	383	JC & RB
8/5	Deena	C	13:26	Ukn	Ukn	-24.17601	30.88862	208	75	383	JC & RB
8/5	Dutch	C	13:29	Ukn	Ukn	-24.17601	30.88862	130	30	383	JC & RB
8/5	Zulu	C	13:31	Ukn	Ukn	-24.17601	30.88862	95	10	383	JC & RB
8/5	Deena	C	13:41	Ukn	Ukn	-24.17739	30.88887	185	30	369	JC & RB
8/5	Zulu	C	14:06	Ukn	Ukn	-24.17795	30.89539	40	20	369	JC & RB
8/5	Aphela	C	11:57	Ukn	Ukn	-24.17923	30.92111	235	30	417	JC & RB
8/5	Dutch	C	12:00	Ukn	Ukn	-24.17923	30.92111	340	30	417	JC & RB
8/5	Deena	C	13:49	Ukn	Ukn	-24.18039	30.89145	290	30	401	JC & RB
8/5	Zulu	C	13:52	Ukn	Ukn	-24.18039	30.89145	55	30	401	JC & RB
8/5	Aphela	C	13:05	Ukn	Ukn	-24.18152	30.89464	113	15	403	JC & RB
8/5	Deena	C	13:12	Ukn	Ukn	-24.18152	30.89464	298	25	403	JC & RB
8/5	Dutch	C	13:15	Ukn	Ukn	-24.18152	30.89464	80	30	403	JC & RB
8/5	Ntom	C	9:48	Ukn	Ukn	-24.18733	30.95872	130	20	423	JC & RB
8/5	Aphela	C	11:25	Ukn	Ukn	-24.19250	30.92946	345	20	447	JC & RB
8/5	Deena	C	11:28	Ukn	Ukn	-24.19250	30.92946	348	15	447	JC &RB
8/5	Ntom	C	10:30	Ukn	Ukn	-24.19709	30.94694	60	20	462	JC & RB
8/5	Xena	C	10:36	Ukn	Ukn	-24.19709	30.94694	35	30		JC & RB
8/7	Buza	C	8:54	Ukn	Ukn	-24.17234	30.95188	90	30	439	JC & RB
8/7	Ntom	C	9:00	Ukn	Ukn	-24.17234	30.95188	105	30	439	JC & RB
8/7	Buza	C	9:24	Ukn	Ukn	-24.18155	30.95621	75	30	424	JC & RB
8/7	Ntom	C	9:25	Ukn	Ukn	-24.18155	30.95621	170	30	424	JC & RB

8/7	Ntom	C	9:34	Ukn	Ukn	-24.19332	30.96186	60	30	416	JC & RB
8/7	Deena	A	12:00	Yes	No	-24.17949	30.90627	N/A	N/A	369	SB
8/7	Aphela	A	11:25	No	No	-24.18854	30.90515	N/A	N/A	335	SB & JC
8/7	Dutch	A	12:39	Yes	No	-24.18233	30.89089	N/A	N/A	392	Vehicle
8/7	Khuza	A	14:43	Yes	No	-24.18953	30.83393	N/A	N/A	397	Vehicle
8/9	Deena	C	8:33	Ukn	Ukn	-24.17257	30.95185	255	30	435	JC & RB
8/9	Zoliswe	C	8:54	Ukn	Ukn	-24.17257	30.95185	130	20	435	JC & RB
8/9	Deena	C	12:50	Ukn	Ukn	-24.17943	30.88059	120	40	408	JC & RB
8/9	Deena	C	14:28	Ukn	Ukn	-24.18056	30.88799	220	30	377	JC & RB
8/9	Deena	C	10:54	Ukn	Ukn	-24.18196	30.89499	328	25	410	JC & RB
8/9	Dutch	C	10:56	Ukn	Ukn	-24.18196	30.89499	275	30	410	JC & RB
8/9	Zoliswe	C	9:29	Ukn	Ukn	-24.18322	30.95662	55	10	424	JC & RB
8/9	Ntom	C	4:20	Ukn	Ukn	-24.18567	30.95706	85	30	435	JC & RB
8/9	Ntom	C	4:38	Ukn	Ukn	-24.18642	30.96036	60	20	410	JC & RB
8/9	Ntom	C	4:28	Ukn	Ukn	-24.18915	30.96116	45	40	397	JC & RB
8/9	Deena	C	11:21	Ukn	Ukn	-24.20047	30.85431	60	40	509	JC & RB
8/9	Dutch	C	11:23	Ukn	Ukn	-24.20047	30.85431	105	30	509	JC & RB
8/9	Ntom	A	10:05	No	No	-24.18543	30.95716	N/A	N/A	435	SB & JC
8/9	Khuza	A	15:00	No	No	-24.17682	30.88511	N/A	N/A	384	Vehicle
8/9	Zulu	A	15:00	No	No	-24.17682	30.88511	N/A	N/A	384	Vehicle
8/14	Ntom	C	13:38	Ukn	Ukn	-24.17237	30.95188	165	50	444	JC & RB
8/14	Zoliswe	C	13:33	Ukn	Ukn	-24.17237	30.95188	145	10	444	JC & RB
8/14	Deena	C	10:15	Ukn	Ukn	-24.17597	30.88858	260	30	380	JC & RB
8/14	Khuza	C	10:18	Ukn	Ukn	-24.17597	30.88858	223	25	380	JC & RB
8/14	Aphela	C	12:22	Ukn	Ukn	-24.17924	30.02098	245	30	418	JC & RB
8/14	Dutch	C	12:19	Ukn	Ukn	-24.17924	30.92098	225	20	418	JC & RB
8/14	Aphela	C	11:07	Ukn	Ukn	-24.18152	30.89455	103	25	405	JC & RB
8/14	Deena	C	9:58	Ukn	Ukn	-24.18152	30.89455	265	30	405	JC & RB
8/14	Khuza	C	10:03	Ukn	Ukn	-24.18152	30.89455	278	35	405	JC & RB
8/14	Ntom	C	13:14	Ukn	Ukn	-24.18235	30.93682	125	10	430	JC & RB
8/14	Zoliswe	C	13:16	Ukn	Ukn	-24.18235	30.93682	170	10	430	JC & RB
8/14	Khuza	C	10:41	Ukn	Ukn	-24.18255	30.88192	130	20	405	JC & RB
8/14	Dutch	C	12:50	Ukn	Ukn	-24.18266	30.92845	230	30	421	JC & RB
8/14	Deena	C	10:32	Ukn	Ukn	-24.18872	30.88725	320	20	407	JC & RB
8/14	Khuza	C	10:34	Ukn	Ukn	-24.18872	30.88725	10	30	407	JC & RB
8/14	Dutch	C	11:57	Ukn	Ukn	-24.19242	30.92944	298	35	451	JC & RB

8/14	Ntom	C	13:56	Ukn	Ukn	-24.19926	30.96520	18	15	432	JC & RB
8/14	Zoliswe	C	13:58	Ukn	Ukn	-24.19926	30.96520	55	10	432	JC & RB
8/14	Khuza	C	9:28	Ukn	Ukn	-24.20049	30.85422	98	15	513	JC & RB
8/14	Khuza	A	12:04	Yes	No	-24.18590	30.88599	N/A	N/A		SB
8/14	Deena	A	14:50	Yes	Yes	-24.18774	30.88411	N/A	N/A		SB
8/15	Khuza	C	8:42	Ukn	Ukn	-24.17238	30.95194	235	20	446	JC/RB
8/15	Ntom	C	8:45	Ukn	Ukn	-24.17238	30.95194	175	10	446	JC/RB
8/15	Qondela	C	8:48	Ukn	Ukn	-24.17238	30.95194	115	40	446	JC/RB
8/15	Xena	C	8:51	Ukn	Ukn	-24.17238	30.95194	85	30	446	JC/RB
8/15	Qondela	C	10:20	Ukn	Ukn	-24.17511	30.95594	100	30	406	JC/RB
8/15	Khuza	A	13:58	No	No	-24.17669	30.88940			365	JC/RB
8/15	Zulu	A	13:58	No	No	-24.17669	30.88940			365	JC/RB
8/15	Ntom	C	9:55	Ukn	Ukn	-24.18266	30.95433	200	40	419	JC/RB
8/15	Aphela	B	13:00	Ukn	Ukn	-24.18280	30.88499			381	JC/RB
8/15	Dutch	B	13:00	Ukn	Ukn	-24.18280	30.88499			381	JC/RB
8/15	Ntom	C	9:43	Ukn	Ukn	-24.18527	30.95664	320	40	438	JC/RB
8/15	Qondela	C	9:45	Ukn	Ukn	-24.18527	30.95664	55	30	438	JC/RB
8/15	Deena	A	12:04	Yes	Yes	-24.18725	30.88450			398	JC/RB
8/15	Dutch	C	11:40	Ukn	Ukn	-24.19843	30.86024	90	20	486	JC/RB
8/15	Thoko	C	11:42	Ukn	Ukn	-24.19843	30.86024	134	30	486	JC/RB
8/15	Aphela	C	11:45	Ukn	Ukn	-24.19843	30.86024	60	30	486	JC/RB
8/17	Ntom	C	14:18	Ukn	Ukn	-24.17235	30.95189	223	15	447	JC
8/17	Zoliswe	C	14:24	Ukn	Ukn	-24.17235	30.95189	193	35		JC
8/17	Khuza	C	11:49	Ukn	Ukn	-24.17683	30.88591	160	20	385	JC
8/17	Khuza	C	12:00	Ukn	Ukn	-24.18007	30.88701	235	20	390	JC
8/17	Ntom	C	14:09	Ukn	Ukn	-24.18643	30.95802	318	25	426	JC
8/17	Zoliswe	C	15:04	Ukn	Ukn	-24.19846	30.96486	75	30	434	JC
8/17	Zoliswe	C	14:53	Ukn	Ukn	-24.20045	30.85436	150	20	456	JC
8/17	Ntom	C	14:00	Ukn	Ukn	-24.20311	30.96644	5	30	449	JC
8/17	Deena	A	11:30	No	No	-24.17876	30.88678	N/A	N/A	390	RB & SB
8/17	Dutch	B	13:10	Ukn	Ukn	-24.18208	30.88516	N/A	N/A	380	SB & JC
8/17	Khuza	A	12:24	No	No	-24.18173	30.88157	N/A	N/A	401	Vehicle
8/18	Zulu	A	12:30	No	No	-24.17697	30.88905	N/A	N/A		Vehicle
8/19	Deena	A	12:00	Yes	No	-24.19043	30.89251	N/N	N/N		Vehicle
8/21	Deena	C	8:36	Ukn	Ukn	-24.17235	30.95191	278	15	441	JC
8/21	Thoko	C	8:40	Ukn	Ukn	-24.17235	30.95191	223	25	441	JC

8/21	Zoliswe	C	16:06	Ukn	Ukn	-24.17235	30.95191	130	30	448	JC
8/21	Aphela	C	10:33	Ukn	Ukn	-24.17597	30.89019	185	20	363	JC
8/21	Deena	C	10:35	Ukn	Ukn	-24.17597	30.89850	275	30	363	JC
8/21	Khuza	C	12:06	Ukn	Ukn	-24.17687	30.88844	110	30	374	JC
8/21	Aphela	C	10:47	Ukn	Ukn	-24.17832	30.90233	155	30	392	JC
8/21	Khuza	C	11:43	Ukn	Ukn	-24.17913	30.89255	13	25	400	JC
8/21	Thoko	C	9:07	Ukn	Ukn	-24.18236	30.93679	223	25	441	JC
8/21	Aphela	C	10:13	Ukn	Ukn	-24.18704	30.89019	100	40	424	JC
8/21	Deena	C	10:17	Ukn	Ukn	-24.18704	30.89019	50	30	424	JC
8/21	Thoko	C	10:20	Ukn	Ukn	-24.18704	30.89019	175	20	424	JC
8/21	Deena	C	9:22	Ukn	Ukn	-24.19245	30.92943	320	20	447	JC
8/21	Zoliswe	C	15:38	Ukn	Ukn	-24.19755	30.96441	130	40	420	JC
8/21	Zoliswe	C	15:31	Ukn	Ukn	-24.20849	30.96858	75	30	436	JC
8/21	Aphela	A	11:30	No	No	-24.18421	30.90557	N/A	N/A	379	RB & SB
8/21	Dutch	A	13:00	No	No	-24.18175	30.88651	N/A	N/A	371	SB & JC
8/21	Deena	A	11:55	dist	No	-24.17737	30.89126	N/A	N/A	376	Vehicle
8/23	Khuza	A	15:57	Yes	Yes	-24.17814	30.89501	N/A	N/A		Vehicle
8/23	Deena	A	15:53	Yes	Yes	-24.17880	30.89431	N/A	N/A		Vehicle
8/30	Ntom	A	9:21	No	No	-24.18085	30.94221	N/A	N/A	430	JC & SB
8/30	Aphela	A	11:40	dist	No	-24.18624	30.91983	N/A	N/A	394	JC & SB
8/30	Dutch	A	11:40	dist	No	-24.18624	30.91983	N/A	N/A	394	JC & SB
8/30	Khuza	A	10:44	No	No	-24.17719	30.88866	N/A	N/A	379	Vehicle
8/30	Zulu	A	10:44	No	No	-24.17719	30.88866	N/A	N/A	379	Vehicle
9/2	Deena	C	15:53	Ukn	Ukn	-24.17639	30.88811	210	20	378	JC
9/2	Dutch	C	15:56	Ukn	Ukn	-24.17639	30.88811	225	30	378	JC
9/2	Deena	C	15:43	Ukn	Ukn	-24.18141	30.89249	285	30	396	JC
9/2	Dutch	C	15:40	Ukn	Ukn	-24.18141	30.89249	285	30	396	JC
9/2	Deena	C	16:19	Ukn	Ukn	-24.18988	30.88589	2.5	25	413	JC
9/2	Dutch	C	16:17	Ukn	Ukn	-24.18988	30.88589	15	20	413	JC
9/4	Khuza	A	14:48	No	N0	-24.17742	30.88895	N/A	N/A	365	Vehicle
9/5	Deena	B	12:43	No	No	-24.17873	30.86418	N/A	N/A		SB
9/5	Aphela	A	13:41	No	No	-24.18118	30.88991	N/A	N/A		SB

9/11	Aphela	C	10:02	Ukn	Ukn	-24.17600	30.88860	210	10	379	JC
9/11	Deena	C	10:05	Ukn	Ukn	-24.17600	30.88860	280	30	370	JC
9/11	Khuza	C	10:07	Ukn	Ukn	-24.17600	30.88860	160	20	379	JC
9/11	Aphela	C	10:37	Ukn	Ukn	-24.18221	30.89323	290	20	409	JC
9/11	Aphela	C	10:23	Ukn	Ukn	-24.18888	30.88712	15	30	416	JC
9/11	Deena	C	10:25	Ukn	Ukn	-24.18888	30.88712	345	30	416	JC
9/11	Deena	C	9:32	Ukn	Ukn	-24.20054	30.85420	60	30	515	JC
9/11	Khuza	C	9:28	Ukn	Ukn	-24.20054	30.85420	90	20	515	JC
9/12	Deena	C	13:05	Ukn	Ukn	-24.18458	30.88283	205	10	396	JC
9/12	Khuza	C	13:08	Ukn	Ukn	-24.18458	30.88283	95	50	396	JC
9/12	Deena	C	13:19	Ukn	Ukn	-24.19330	30.88637	275	30	413	JC
9/12	Khuza	C	13:21	Ukn	Ukn	-24.19330	30.88637	350	20	413	JC
9/12	Deena	C	13:36	Ukn	Ukn	-24.19793	30.88140	330	10	428	JC
9/13	Ntom	C	11:56	Ukn	Ukn	-24.17233	30.95192	172.5	25	443	JC
9/13	Aphela	C	10:44	Ukn	Ukn	-24.17926	30.92104	117.5	15	414	JC
9/13	Aphela	C	11:11	Ukn	Ukn	-24.17996	30.92513	170	10	423	JC
9/13	Aphela	C	11:03	Ukn	Ukn	-24.18356	30.93356	280	10	429	JC
9/13	Ntom	C	12:33	Ukn	Ukn	-24.18490	30.95640	67.5	15	437	JC
9/13	Aphela	C	11:26	Ukn	Ukn	-24.18558	30.93292	267.5	25	428	JC
9/13	Ntom	C	12:11	Ukn	Ukn	-24.19761	30.96644	0	30	427	JC
9/13	Deena	A	9:25	Yes	No	-24.17673	30.88916	N/A	N/A	375	Vehicle
9/13	Zulu	A	9:25	Yes	No	-24.17673	30.88916	N/A	N/A	375	Vehicle
9/16	Khuza	A	15:30	No	No	-24.18510	30.89183	N/A	N/A		SB
9/16	Zulu	A	15:30	No	No	-24.18510	30.89183	N/A	N/A		SB
9/16	Ntom	C	13:37			-24.17233	30.95190	160	30	444	
9/16	Ntom	C	14:04			-24.18126	30.95591	250	30	417	
9/16	Deena	C	11:41			-24.18152	30.89458	290	30	404	
9/16	Khuza	C	11:43			-24.18152	30.89458	255	30	404	
9/16	Ntom	C	13:58			-24.18568	30.95704	325	10	504	
9/16	Khuza	C	12:17			-24.18724	30.88991	270	10	415	
9/16	Deena	C	12:24			-24.18793	30.88843	337.5	15	412	
9/16	Khuza	C	12:22			-24.18793	30.88843	247.5	25	412	
9/16	Deena	C	12:09			-24.18994	30.88564	30	20	408	
9/16	Deena	C	12:02			-24.19295	30.88275	355	20	413	
9/16	Khuza	C	12:01			-24.19295	30.88275	55	30	413	
9/19	Ntom	C	12:24			-24.17236	30.95192	130	20	449	RB
9/19	Deena	C	10:25			-24.17640	30.88809	97.5	35	378	RB
9/19	Deena	C	10:03			-24.18128	30.89450	30	40	390	RB

9/19	Aphela	C	11:26			-24.18230	30.93681	255	50	433	RB
9/19	Ntom	C	12:38			-24.18244	30.95672	95	30	438	RB
9/19	Ntom	C	12:44			-24.18533	30.95667	40	20	439	RB
9/19	Aphela	C	11:41			-24.19254	30.92941	290	40	453	RB
9/20	Deena	A	10:19	No	No	-24.19554	30.88160				SB
9/20	Dutch	A	12:51	No	No	-24.18521	30.93047				SB
9/20	Ntom	A	12:34	No	No	-24.17236	30.95179				SB
9/20	Aphela	A	8:45	Yes	No	-24.18202	30.88514				SB
9/24	Thoko	A	13:03	No	No	-24.24225	30.92483	N/A	N/A	498	JC
9/25	Khuza	A	4:32	Yes	Yes	-24.20965	30.88267	N/A	N/A	416	JC
9/25	Zulu	A	4:32	Yes	Yes	-24.20965	30.88267	N/A	N/A	416	JC
10/1	Khuza	A	13:03	No	No	-24.18012	30.86427	N/A	N/A	401	JC
10/1	Deena	A	14:01	No	No	-24.18574	30.88131	N/A	N/A	407	JC
10/2	Khuza	A	4:15	Yes	Yes	-24.20895	30.88162	N/A	N/A	411	JC
10/2	Zulu	A	4:15	Yes	Yes	-24.20895	30.88162	N/A	N/A	411	JC
10/6	Khuza	A	2:34	No	No	-24.19200	30.82659	N/A	N/A	389	JC
10/6	Zulu	A	2:34	No	No	-24.19200	30.82659	N/A	N/A	389	JC
10/6	Aphela	A	12:45	No	No	-24.17905	30.88528	N/A	N/A		SB
10/6	Deena	A	12:30	No	No	-24.17831	30.88232	N/A	N/A		SB
10/11	Aphela	A	12:28	Yes	Yes	-24.17894	30.89017	N/A	N/A	383	JC
10/11	Deena	A	12:28	Yes	Yes	-24.17894	30.89017	N/A	N/A	383	JC
10/11	Khuza	C	12:58	Ukn	Ukn	-24.18254	30.89356	289	10	407	JC
10/11	Khuza	C	15:15	Ukn	Ukn	-24.18363	30.88235	17.5	25	405	JC
10/11	Khuza	C	13:06	Ukn	Ukn	-24.18775	30.88815	340	20	413	JC
10/15	Aphela	A	11:22	No	No	-24.17880	30.91360				SB
10/15	Dutch	A	11:22	No	No	-24.17880	30.91360				SB
10/15	Khuza	A	7:45	Yes	No	-24.19060	30.82560				SB
10/15	Deena	A	9:45	Yes	No	-24.20060	30.88140				SB
10/18	Ntom	C	10:24	Ukn	Ukn	-24.17236	30.95190	225	30	444	JC
10/18	Khuza	C	13:19	Ukn	Ukn	-24.17384	30.86116	240	40	379	JC
10/18	Khuza	C	13:27	Ukn	Ukn	-24.17488	30.86124	297.5	45	383	JC
10/18	Khuza	A	13:35	Yes	No	-24.17490	30.86070	N/A	N/	386	JC

									A		
10/18	Zulu	A	13:35	Yes	No	-24.17490	30.86070	N/A	N/ A	386	JC
10/18	Deena	C	11:56	Ukn	Ukn	-24.18152	30.89462	245	30	404	JC
10/18	Ntom	C	10:43	Ukn	Ukn	-24.18231	30.93679	205	10	443	JC
10/18	Khuza	C	13:03	Ukn	Ukn	-24.18285	30.85476	65	30	430	JC
10/18	Deena	C	12:13	Ukn	Ukn	-24.18590	30.89063	295	10	410	JC
10/18	Deena	A	12:17	Yes	No	-24.18590	30.89063	N/A	N/ A	410	JC
10/18	Ntom	C	10:56	Ukn	Ukn	-24.18644	30.93612	222.5	15	443	JC
10/18	Deena	C	12:05	Ukn	Ukn	-24.18794	30.88842	47.5	15	412	JC
10/18	Ntom	C	11:07	Ukn	Ukn	-24.19242	30.92949	125	30	445	JC
10/19	Deena	C	11:35			-24.17345	30.88306	195	30	386	RB
10/19	Deena	C	11:21			-24.17641	30.88811	235	10	367	RB
10/19	Deena	C	11:08			-24.18153	30.89459	330	20	407	RB
10/20	Deena	A	10:24			-24.17923	30.90080				SB
10/20	Khuza	A	8:36			-24.18920	30.84540				SB
10/23	Aphela	C	9:39			-24.17230	30.95192	220	20	446	RB/JC
10/23	Deena	C	9:40			-24.17230	30.95192	247.5	25	446	RB/JC
10/23	Ntom	C	9:45			-24.17230	30.95192	205	30	446	RB/JC
10/23	Deena	C	13:50			-24.17673	30.86199	175	30	393	RB/JC
10/23	Aphela	C	11:09			-24.17925	30.92110	110	30	398	RB/JC
10/23	Khuza	C	14:12			-24.18036	30.86189	150	40	381	RB/JC
10/23	Khuza	B	14:16		Yes	-24.18036	30.86189			381	RB/JC
10/23	Zulu	C	14:15			-24.18036	30.86189	140	20	381	RB/JC
10/23	Zulu	B	14:16		Yes	-24.18036	30.86189			381	RB/JC
10/23	Khuza	A	14:23	Yes	Yes	-24.18044	30.86296			393	RB/JC
10/23	Zulu	A	14:23	Yes	Yes	-24.18044	30.86296			393	RB/JC
10/23	Ntom	C	10:30			-24.18560	30.93412	237.5	25	436	RB/JC
10/23	Aphela	C	11:24			-24.18591	30.92541	32.5	35	422	RB/JC
10/23	Ntom	C	10:43			-24.18905	30.93298	335	30	444	RB/JC
10/23	Ntom	C	10:19			-24.19241	30.92948	57.5	25	446	RB/JC
10/23	Aphela	C	11:31			-24.19244	30.92946	25	10	443	RB/JC
10/23	Deena	C	13:17			-24.20050	30.85422	70	20	507	RB/JC
10/23	Khuza	C	13:15			-24.20050	30.85422	50	40	507	RB/JC
10/29	Khuza	A	13:30	Yes	Yes	-24.19131	30.86650				Vehicle
10/29	Zulu	A	13:30	Yes	Yes	-24.19131	30.86650				Vehicle
10/31	Ntom	C	18:25	Ukn	Ukn	-24.17259	30.95204	210			FV
10/31	Ntom	C	18:16	Ukn	Ukn	-24.19960	30.96582	300			FV
10/31	Deena	B	12:30	Ukn	Ukn	-24.18200	30.93009				FV & JC
10/31	Aphela	B	13:45	Yes	Ukn	-24.18263	30.93105				FV & JC

10/31	Khuza	A	16:32	Yes	Yes	-24.20633	30.90685				Vehicle
11/1	Aphela	A	14:51	No	No	-24.18629	30.91620				FV
11/1	Ntom	B	10:30	Ukn	Ukn	-24.19341	30.95433				FV
11/2	Dutch	A	9:18	Yes	Yes	-24.18127	30.91021			386	SB
11/7	Dutch	B	12:30	No	No	-24.18122	30.88586				FV
11/7	Aphela	A	10:30	Yes	Yes	-24.18135	30.88518				FV
11/7	Ntom	C	15:30	Ukn	Ukn	-24.18531	30.95669	80			FV
11/7	Zoliswe	C	15:30	Ukn	Ukn	-24.18531	30.95669	225			FV
11/7	Ntom	C	15:45	Ukn	Ukn	-24.20127	30.96578	10			FV
11/7	Zoliswe	C	15:48	Ukn	Ukn	-24.20238	30.96623	315			FV
11/7	Deena	A	13:30	Yes	Yes	-24.19919	30.89746				Vehicle
11/7	Khuza	A	14:19	No	No	-24.20691	30.88663				Vehicle
11/7	Zulu	A	14:19	No	No	-24.20691	30.88663				Vehicle
11/10	Aphela	B	12:09	Ukn	Ukn	-24.18692	30.91542				FV
11/10	Ntom	A	10:41	NO	No	-24.18961	30.94805				FV
11/10	Deena	A	12:54	Yes	No	-24.19692	30.87851				FV
11/10	Khuza	A	15:08	Yes	No	-24.22813	30.90520				FV
11/10	Zulu	A	15:08	Yes	No	-24.22813	30.90520				FV
11/13	Deena	B	13:04	Ukn	Ukn	-24.18496	30.89698	N/A			FV
11/13	Aphela	A	11:45	No	No	-24.18711	30.91544	N/A			FV
11/13	Ntom	B	15:56	Ukn	Ukn	-24.18764	30.93991	N/A			FV
11/17	Zulu	A	14:23	No	No	-24.23045	30.90519			449	SB
11/19	Khuza	A	7:23	NO	No	-24.18453	30.85658			397	JC
11/19	Zulu	A		Yes	Yes	-24.21135	30.87368			438	SB
11/21	Khuza	A	12:55	No	No	-24.17522	30.88830			369	SB
11/21	Aphela	A	13:40	No	No	-24.18580	30.90621			370	SB
11/21	Deena	B	13:40	No	No	-24.18580	30.90621			370	SB
11/21	Zolisa	A	11:10	No	No	-24.20401	30.93821			441	SB
11/22	Khuza	A	12:55	No	No	-24.17522	30.88830			369	SB
11/22	Zulu	A	10:30	Yes	No	-24.20887	30.88157				
11/22	Zulu	A	13:00	Yes	No	-24.20887	30.88157				
11/23	Aphela	C	10:46	Ukn	Ukn	-24.18606	30.86910	102.5	35	435	JC
11/23	Dutch	A	13:27	No	No	-24.18619	30.91589			392	JC
11/23	Aphela	C	11:02	Ukn	Ukn	-24.18678	30.87201	345	30	426	JC
11/23	Aphela	C	10:52	Ukn	Ukn	-24.18718	30.86919	57.5	25	447	JC
11/26	Khuza	A	11:00	Yes	Yes	-24.17779	30.89218			372	SB
11/26	Aphela	A	13:05	Yes	No	-24.18560	30.94893			427	SB
11/26	Deena	A	11:53	Yes	Yes	-24.20506	30.91031			429	SB
11/30	Khuza	C	12:54	Ukn	Ukn	-24.17199	30.86007	112.5	25	370	JC
11/30	Zulu	C	12:55	Ukn	Ukn	-24.17199	30.86007	110	20	370	JC

11/30	Khuza	A	13:26	No	No	-24.17327	30.86212				JC
11/30	Zulu	A	13:26	No	No	-24.17327	30.86212				JC
11/30	Khuza	C	12:43	Ukn	Ukn	-24.17532	30.86156	10	10	388	JC
11/30	Zulu	C	12:45	Ukn	Ukn	-24.17532	30.86156	10	10	388	JC
11/30	Aphela	C	14:35	Ukn	Ukn	-24.18151	30.89460	245	30	408	JC
11/30	Aphela	C	14:43	Ukn	Ukn	-24.18746	30.88895	330	20	418	JC

AoS = Angle of Sensitivity El= Elevation (meters) Tech= Technician
JC= John Clark RB= Rachel Beyke SB= Stefan Bosman
FV= Francois Van Der Merwe

A sightings are visuals
B sightings occur when the animal can be heard but dangerous conditions prevented visuals
C sightings are bearings collected with VHF telemetry equipment, the locations given represent the location of the receiver and technician, not that of the animal
All times given are local

APPENDIX C

Location Estimates Based Upon Bearings in Appendix A

Date	Rhino	Sighting Type	Latitude	Longitude
7/23/2012	Aphela	C	-24.1848	30.9409
8/2/2012	Aphela	C	-24.1834	30.9237
8/5/2012	Aphela	C	-24.1874	30.9094
8/31/2012	Aphela	C	-24.1800	30.8837
9/11/2012	Aphela	C	-24.1808	30.8893
9/13/2012	Aphela	C	-24.1842	30.9257
10/23/2012	Aphela	C	-24.1806	30.931
7/22/2012	Deena	C	-24.1778	30.9209
7/24/2012	Deena	C	-24.1819	30.8985
8/1/2012	Deena	C	-24.1640	30.9251
8/5/2012	Deena	C	-24.1793	30.8883
8/31/2012	Deena	C	-24.1793	30.8867
9/2/2012	Deena	C	-24.1797	30.8862
9/11/2012	Deena	C	-24.1751	30.8834
9/12/2012	Deena	C	-24.1928	30.8786
9/16/2012	Deena	C	-24.1786	30.8864
9/19/2012	Deena	C	-24.1776	30.8966
10/19/2012	Deena	C	-24.1814	30.881
10/23/2012	Deena	C	-24.1970	30.8638
7/24/2012	Duchess	C	-24.1841	30.9188
8/1/2012	Duchess	C	-24.1944	30.9109
8/2/2012	Duchess	C	-24.1854	30.9254
8/14/2012	Duchess	C	-24.1881	30.9145
8/31/2012	Duchess	C	-24.1836	30.9129
9/2/2012	Duchess	C	-24.1794	30.8851
7/30/2012	Khuza	C	-24.1686	30.9089
8/2/2012	Khuza	C	-24.1833	30.8831
8/21/2012	Khuza	C	-24.1785	30.8927
9/11/2012	Khuza	C	-24.2005	30.8975
9/12/2012	Khuza	C	-24.1848	30.8849

10/11/2012	Khuza	C	-24.1786	30.884
7/23/2012	Lima	C	-24.1924	30.9453
8/1/2012	Lima	C	-24.1952	30.9247
7/30/2012	Ntombizana	C	-24.1847	30.9535
8/1/2012	Ntombizana	C	-24.1805	30.966
8/5/2012	Ntombizana	C	-24.1892	30.961
8/7/2012	Ntombizana	C	-24.1808	30.9836
8/9/2012	Ntombizana	C	-24.1839	30.966
8/14/2012	Ntombizana	C	-24.1976	30.9587
8/15/2012	Ntombizana	C	-24.1826	30.9543
8/17/2012	Ntombizana	C	-24.1761	30.9485
9/13/2012	Ntombizana	C	-24.1808	30.9664
9/16/2012	Ntombizana	C	-24.1818	30.9545
9/19/2012	Ntombizana		-24.1801	30.9611
10/18/2912	Ntombizana	C	-24.1932	30.9306
10/23/2012	Ntombizana	C	-24.1970	30.9638
10/31/2012	Ntombizana	C	-24.1869	30.9438
8/5/2012	Zulu	C	-24.1767	30.8964
11/7/2012	Ntombizana	C	-24.1831	30.969
11/23/2012	Aphela	C	-24.1862	30.8718
11/30/2012	Aphela	C	-24.1848	30.8875

APPENDIX D

Raw Forage Data

# Bites	Species	Bite Height	Total Height
3	*Acacia erubescens*	3	3
1	*Acacia erubescens*	3	7
4	*Acacia erubescens*	3	7
1	*Acacia erubescens*	2	7
5	*Acacia nigresens*	3	7
3	*Boscia albitrunca*	4	4
9	*Boscia albitrunca*	3	4
1	*Boscia albitrunca*	3	3
2	*Boscia albitrunca*	2	3
8	*Boscia albitrunca*	3	4
3	*Boscia albitrunca*	1	2
15	*Boscia foetida*	1	1
19	*Boscia foetida*	2	2
20	*Boscia foetida*	1	2
7	*Boscia foetida*	1	2
3	*Boscia foetida*	2	2
3	*Boscia foetida*	2	3
2	*Boscia foetida*	3	3
4	*Boscia foetida*	2	2
5	*Boscia foetida*	1	2
2	*Boscia foetida*	2	2
3	*Boscia spp*	1	1
23	*Boscia spp*	2	2
34	*Boscia spp*	1	2
21	*Boscia spp*	2	2
4	*Boscia spp*	2	3
6	*Boscia spp*	1	2
4	*Boscia spp*	1	1
25	*Boscia spp*	2	3
8	*Boscia spp*	3	3

1	*Boscia spp*	2	2
7	*Boscia spp*	1	2
3	*Boscia spp*	3	4
2	*Boscia spp*	2	2
14	*Boscia spp*	1	2
4	*Boscia spp*	2	2
3	*Boscia spp*	1	1
1	*Combretum apiculatum*	2	6
5	*Combretum apiculatum*	3	6
2	*Combretum apiculatum*	4	6
8	*Combretum apiculatum*	2	2
6	*Combretum apiculatum*	3	5
7	*Combretum apiculatum*	3	6
1	*Combretum apiculatum*	2	6
3	*Combretum apiculatum*	4	6
5	*Combretum apiculatum*	3	5
6	*Combretum apiculatum*	4	5
4	*Combretum apiculatum*	4	7
15	Combretum apiculatum	2	7
1	*Combretum apiculatum*	3	7
4	*Combretum apiculatum*	3	7
4	*Combretum apiculatum*	4	7
2	*Combretum apiculatum*	4	4
2	*Combretum apiculatum*	3	4
3	*Combretum apiculatum*	3	7
12	*Combretum apiculatum*	3	5
5	*Combretum apiculatum*	4	5
6	*Combretum apiculatum*	2	5
1	*Combretum apiculatum*	3	7
3	*Combretum apiculatum*	3	6
1	*Combretum apiculatum*	4	6
6	*Combretum apiculatum*	3	5
1	*Combretum apiculatum*	2	5
5	*Combretum apiculatum*	4	5
2	*Combretum imberbe*	3	7
1	*Combretum imberbe*	4	7
2	*Commiphora spp*	2	3
1	*Commiphora spp*	4	4
1	*Commiphora spp*	3	7
2	*Commiphora spp*	2	2

1	*Commiphora spp*	3	3
1	*Commiphora spp*	2	7
3	*Commiphora spp*	3	7
2	*Commiphora spp*	2	4
2	*Commiphora spp*	3	4
10	*Cordia monica*	3	5
1	*Cordia monica*	4	5
2	*Cordia monica*	3	3
3	*Dichrostachys cinera*	2	2
1	*Dichrostachys cinera*	2	2
6	*Diospyrus spp*	2	2
1	*Diospyrus spp*	1	2
25	*Dombeya cymosa*	3	5
6	*Dombeya cymosa*	2	5
7	*Dombeya cymosa*	4	5
13	*Dombeya cymosa*	4	5
20	*Dombeya cymosa*	3	5
16	*Dombeya cymosa*	2	5
2	*Dombeya cymosa*	2	6
12	*Dombeya cymosa*	3	6
15	*Ehretia amoena*	3	4
6	*Ehretia amoena*	4	4
11	*Ehretia amoena*	2	4
23	*Euclea crispa*	1	2
17	*Euclea crispa*	2	2
14	*Euclea crispa*	2	2
20	*Euclea crispa*	1	2
47	*Euclea crispa*	2	2
32	*Euclea crispa*	3	3
32	*Euclea crispa*	2	3
26	*Euclea crispa*	3	3
12	*Euclea crispa*	2	4
17	*Euclea crispa*	3	4
3	*Euclea crispa*	4	4
7	*Euclea divinorum*	3	4
18	*Euclea divinorum*	4	4
7	*Euclea divinorum*	2	4
1	*Euclea divinorum*	1	4
11	*Euclea divinorum*	3	3
8	*Euclea divinorum*	2	3

5	*Euclea divinorum*	1	3
6	*Euclea divinorum*	4	4
9	*Euclea divinorum*	2	4
1	*Euclea divinorum*	1	4
4	*Euclea divinorum*	3	5
4	*Euclea divinorum*	4	5
7	*Euclea divinorum*	1	6
13	*Euclea divinorum*	2	6
3	*Euclea divinorum*	3	6
35	*Euclea divinorum*	3	6
20	*Euclea divinorum*	3	5
13	*Euclea divinorum*	4	5
9	*Euclea divinorum*	3	4
5	*Euclea divinorum*	1	7
6	*Euclea divinorum*	3	7
22	*Euclea divinorum*	2	7
1	*Euclea divinorum*	4	7
22	*Euclea divinorum*	3	6
12	*Euclea divinorum*	2	6
12	*Euclea divinorum*	4	6
28	*Euclea divinorum*	4	6
7	*Euclea divinorum*		6
7	*Euclea divinorum*	2	6
13	*Euclea divinorum*	3	4
15	Euclea divinorum	2	4
10	Euclea divinorum	3	5
1	*Euclea divinorum*	4	5
23	*Euclea divinorum*	2	4
32	*Euclea divinorum*	3	4
7	*Euclea divinorum*	1	4
6	*Euclea divinorum*	4	4
13	*Euclea divinorum*	2	4
23	*Euclea divinorum*	3	4
15	*Euclea divinorum*	4	4
35	*Euclea divinorum*	2	3
27	*Euclea divinorum*	3	4
16	*Euclea divinorum*	2	3
14	*Euclea divinorum*	3	3
4	*Euclea divinorum*	1	3
12	*Euclea divinorum*	3	4

1	*Euclea divinorum*	2	4
4	*Euclea divinorum*	4	4
2	*Euclea divinorum*	2	3
15	*Euclea divinorum*	3	3
4	*Euclea divinorum*	2	3
6	*Euclea divinorum*	2	3
8	*Euclea divinorum*	3	5
4	*Euclea divinorum*	2	4
17	*Euclea divinorum*	2	4
3	*Euclea divinorum*	4	4
3	*Euclea divinorum*	2	2
5	*Euclea divinorum*	3	3
1	*Euclea divinorum*	1	3
5	*Euclea divinorum*	2	3
16	*Euclea divinorum*	3	6
7	Euclea divinorum	2	6
8	*Euclea divinorum*	4	6
2	*Euclea divinorum*	2	5
19	*Euclea divinorum*	3	5
10	*Euclea divinorum*	3	5
11	*Euclea divinorum*	3	4
2	*Euclea divinorum*	2	4
15	*Euclea divinorum*	2	3
22	*Euclea divinorum*	3	3
3	*Euclea divinorum*	3	4
5	*Euclea divinorum*	2	4
16	*Euclea divinorum*	3	4
5	*Euclea divinorum*	2	4
20	*Euclea divinorum*	3	4
6	*Euclea divinorum*	2	2
52	*Euclea divinorum*	3	6
5	*Euclea divinorum*	2	6
17	*Euclea divinorum*	2	3
21	*Euclea divinorum*	3	3
4	*Euclea divinorum*	2	4
1	*Euclea divinorum*	4	4
15	*Euclea divinorum*	3	4
5	*Euclea spp*	1	1
6	*Euclea spp*	1	2
16	*Euclea spp*	2	3

2	*Euclea spp*	3	3
10	*Euclea spp*	3	4
3	*Euclea spp*	4	4
12	*Euclea spp*	2	3
13	*Euclea spp*	3	3
4	*Euclea undulata*	2	4
1	*Euclea undulata*	3	4
4	*Euphorbia spp*	3	7
4	*Euphorbia spp*	1	7
2	*Euphorbia spp*	1	3
2	*Euphorbia spp*	1	3
3	*Euphorbia spp*	1	7
2	*Euphorbia spp*	1	7
3	*Euphorbia spp*	1	7
4	*Euphorbia spp*	1	5
1	*Euphorbia spp*	1	5
2	*Euphorbia spp*	1	7
4	*Euphorbia spp*	2	7
10	*Euphorbia spp*	1	7
7	*Euphorbia spp*	2	5
1	*Euphorbia spp*	4	7
2	*Euphorbia spp*	2	7
3	*Euphorbia spp*	1	7
11	*Euphorbia spp*	2	7
2	*Euphorbia spp*	1	7
3	*Euphorbia spp*	3	7
12	*Euphorbia spp*	3	7
5	*Euphorbia spp*	7	2
2	*Euphorbia spp*	4	7
1	*Euphorbia spp*	1	7
5	*Euphorbia spp*	2	7
1	*Euphorbia spp*	3	7
3	*Euphorbia spp*	3	7
3	*Euphorbia spp*	2	5
7	*Euphorbia spp*	1	5
2	*Euphorbia spp*	3	7
3	*Euphorbia spp*	3	3
4	*Euphorbia spp*	1	2
23	*Euphorbia spp*	2	5
5	*Euphorbia spp*	1	5

3	*Euphorbia spp*	0.1	6
5	*Euphorbia spp*	2	6
4	*Euphorbia spp*	1	4
2	*Euphorbia spp*	2	4
6	*Euphorbia spp*	1	7
10	*Euphorbia spp*	2	7
5	*Euphorbia spp*	3	7
3	*Euphorbia spp*	4	7
3	*Euphorbia spp*	4	7
2	*Euphorbia spp*	3	7
8	*Euphorbia spp*	2	2
2	*Euphorbia spp*	1	2
2	*Euphorbia spp*	4	3
4	*Euphorbia spp*	1	3
1	*Euphorbia spp*	1	3
3	*Euphorbia spp*	2	3
3	*Euphorbia spp*	3	3
11	*Euphorbia spp*	3	7
5	*Euphorbia spp*	2	7
2	*Euphorbia spp*	4	7
6	*Euphorbia spp*	3	7
6	*Euphorbia spp*	3	7
1	*Euphorbia spp*	4	7
1	*Euphorbia spp*	1	7
4	*Euphorbia spp*	2	7
1	*Euphorbia spp*	2	7
6	*Euphorbia spp*	2	7
9	*Euphorbia spp*	3	7
2	*Euphorbia spp*	3	7
1	*Euphorbia spp*	4	7
1	*Euphorbia spp*	3	7
3	*Euphorbia spp*	1	4
2	*Euphorbia spp*	3	7
2	*Euphorbia spp*	3	4
2	*Euphorbia spp*	2	4
1	*Euphorbia spp*	1	4
2	*Euphorbia spp*	4	7
5	*Euphorbia spp*	2	3
1	*Euphorbia spp*	3	7
9	*Euphorbia spp*	2	6

3	*Euphorbia spp*	3	6
1	*Euphorbia spp*	4	6
5	*Euphorbia spp*	1	6
3	*Euphorbia spp*	2	7
3	*Euphorbia spp*	3	7
1	*Euphorbia spp*	2	7
1	*Euphorbia spp*	3	7
5	*Euphorbia spp*	3	5
1	*Euphorbia spp*	1	7
4	*Euphorbia spp*	2	7
7	*Euphorbia spp*	3	7
5	*Euphorbia spp*	3	7
1	*Euphorbia spp*	4	7
4	*Euphorbia spp*	2	6
5	*Euphorbia spp*	3	6
3	*Grewia spp*	1	1
4	*Grewia spp*	2	2
3	*Grewia spp*	1	1
3	*Grewia spp*	1	2
2	*Grewia spp*	1	3
2	*Grewia spp*	2	3
4	*Grewia spp*	3	7
3	*Grewia spp*	3	7
6	*Grewia spp*	2	5
6	*Grewia spp*	3	5
17	*Grewia spp*	1	1
4	*Grewia spp*	1	1
3	*Grewia spp*	1	1
4	*Grewia spp*	1	1
3	*Grewia spp*		
6	*Grewia spp*	2	2
14	*Grewia spp*	2	2
1	*Grewia spp*	1	2
20	*Grewia spp*	1	1
4	*Grewia spp*	1	1
3	*Grewia spp*	2	3
6	*Grewia spp*	2	2
5	*Grewia spp*	2	3
8	*Grewia spp*	3	3
2	*Grewia spp*	2	3

2	*Grewia spp*	3	3
3	*Grewia spp*	1	3
12	*Grewia spp*	1	2
7	*Grewia spp*	2	2
2	*Grewia spp*	2	5
1	*Grewia spp*	1	2
1	*Grewia spp*	2	5
2	*Grewia spp*	3	5
4	*Grewia spp*	2	4
8	*Grewia spp*	3	4
11	*Grewia spp*	2	5
17	*Grewia spp*	3	5
2	*Grewia spp*	4	5
2	*Grewia spp*	1	5
1	*Grewia spp*	3	4
8	*Grewia spp*	1	1
8	*Grewia spp*	2	5
17	*Grewia spp*	3	5
4	*Grewia spp*	3	6
2	*Grewia spp*	4	6
6	*Grewia spp*	2	6
1	*Grewia spp*	3	6
3	*Grewia spp*	2	3
9	*Grewia spp*	3	3
15	*Grewia spp*	2	4
18	*Grewia spp*	3	4
5	*Grewia spp*	3	3
3	*Grewia spp*	2	3
3	*Grewia spp*	2	6
10	*Grewia spp*	3	6
5	*Grewia spp*	2	5
3	*Grewia spp*	3	5
18	*Grewia spp*	2	4
14	*Grewia spp*	3	4
7	*Grewia spp*	3	5
4	*Grewia spp*	2	3
3	*Grewia spp*	4	4
3	*Grewia spp*	2	3
2	*Grewia spp*	1	3
4	*Grewia spp*	2	4

1	*Grewia spp*	3	5
3	*Grewia spp*	4	4
5	*Grewia spp*	3	4
6	*Grewia spp*	1	2
7	*Grewia spp*	2	4
9	*Grewia spp*	3	4
8	*Grewia spp*	2	3
13	*Grewia spp*	3	3
32	*Grewia spp*	3	7
6	*Grewia spp*	4	7
23	*Grewia spp*	2	7
5	*Grewia spp*	3	6
14	*Grewia spp*	2	6
35	*Grewia spp*	3	6
7	*Grewia spp*	4	6
15	*Grewia spp*	3	3
2	*Grewia spp*	2	3
3	Grewia spp	2	4
2	*Grewia spp*	4	4
3	*Grewia spp*	3	4
10	*Grewia spp*	3	4
6	*Grewia spp*	4	4
2	*Grewia spp*	2	4
35	*Grewia spp*	3	4
3	*Grewia spp*	4	4
14	*Grewia spp*	2	4
10	*Grewia spp*	4	6
21	*Grewia spp*	3	6
5	*Grewia spp*	3	4
1	*Grewia spp*	2	4
8	*Grewia spp*	2	5
19	*Grewia spp*	3	5
5	*Grewia spp*	4	5
2	*Grewia spp*	4	5
3	*Grewia spp*	3	3
20	*Grewia spp*	2	3
3	*Grewia spp*	4	4
14	*Grewia spp*	3	4
27	*Grewia spp*	2	4
3	*Grewia spp*	2	4

40	*Grewia spp*	3	4
6	*Grewia spp*	4	4
6	*Grewia spp*	2	4
1	*Grewia spp*	2	6
9	*Grewia spp*	3	6
4	*Grewia spp*	4	6
11	Grewia spp	1	1
1	*Grewia spp*	2	4
4	*Grewia spp*	1	1
2	*Grewia spp*	3	4
1	*Grewia spp*	4	4
2	*Grewia spp*	3	5
2	*Grewia spp*	1	1
5	*Grewia spp*	2	3
8	*Grewia spp*	1	3
7	*Grewia spp*	3	3
5	*Grewia spp*	2	3
6	*Grewia spp*	2	2
8	*Grewia spp*	2	2
4	*Grewia spp*	1	2
10	*Grewia spp*	2	3
23	*Grewia spp*	2	7
3	*Grewia spp*	2	3
4	*Grewia spp*	3	3
3	*Grewia spp*	2	2
1	*Grewia spp*	1	2
1	*Grewia spp*	2	2
8	*Grewia spp*	1	3
5	Grewia spp	2	3
3	*Grewia spp*	1	2
2	*Grewia spp*	2	2
2	*Grewia spp*	2	6
2	*Grewia spp*	2	4
10	*Grewia spp*	3	4
1	*Grewia spp*	4	4
4	*Grewia spp*	2	2
7	*Grewia spp*	1	6
8	*Grewia spp*	2	6
4	*Grewia spp*	3	6
10	*Grewia spp*	3	4

8	*Grewia spp*	3	4
1	Grewia spp	2	4
5	*Grewia spp*	2	3
9	*Grewia spp*	3	5
10	*Grewia spp*	4	5
1	*Grewia spp*	3	4
17	*Grewia spp*	2	4
2	*Grewia spp*	1	4
17	*Grewia spp*	1	4
2	*Grewia spp*	2	4
16	*Grewia spp*	1	2
9	*Grewia spp*	2	2
7	*Grewia spp*	2	5
7	*Grewia spp*	3	5
1	*Grewia spp*	4	5
9	*Grewia spp*	2	4
12	*Grewia spp*	3	4
5	*Grewia spp*	3	3
3	*Grewia spp*	2	2
4	*Grewia spp*	3	3
4	*Grewia spp*	2	3
1	*Grewia spp*	1	3
9	*Grewia spp*	2	6
3	*Grewia spp*	3	6
1	*Grewia spp*	4	6
9	*Grewia spp*	2	5
2	*Grewia spp*	4	5
14	*Grewia spp*	2	3
3	*Grewia spp*	3	3
5	*Grewia spp*	3	5
4	*Grewia spp*	3	5
3	*Grewia spp*	2	2
2	*Grewia spp*	1	4
10	*Grewia spp*	3	4
1	*Grewia spp*	4	4
1	*Grewia spp*	2	4
8	*Grewia spp*	2	3
9	*Grewia spp*	3	3
3	*Grewia spp*	3	4
16	*Grewia spp*	2	4

4	*Grewia spp*	3	4
7	*Grewia spp*	2	3
5	*Grewia spp*	3	3
13	*Grewia spp*	2	4
7	*Grewia spp*	3	4
3	*Grewia spp*	4	4
1	*Grewia spp*	4	5
19	*Grewia spp*	3	5
4	*Grewia spp*	2	5
13	*Grewia spp*	2	4
4	*Grewia spp*	3	4
1	*Grewia spp*	1	4
9	*Grewia spp*	4	6
10	*Grewia spp*	2	6
5	*Grewia spp*	3	6
24	*Grewia spp*	3	5
11	*Grewia spp*	2	5
5	*Grewia spp*	4	5
5	*Grewia spp*	3	4
4	*Grewia spp*	3	5
2	*Grewia spp*	2	5
9	*Grewia spp*	2	5
10	Grewia spp	3	5
3	*Grewia spp*	4	5
3	*Grewia spp*	2	3
2	*Grewia spp*	3	3
11	*Grewia spp*	3	4
9	*Grewia spp*	2	4
4	*Grewia spp*	3	5
2	Grewia spp	2	5
15	*Grewia spp*	2	3
14	*Grewia spp*	3	4
4	*Grewia spp*	2	4
1	*Grewia spp*	2	5
3	*Grewia spp*	3	5
3	*Grewia spp*	2	3
2	*Grewia spp*	3	3
2	*Grewia spp*	2	2
8	*Grewia spp*	2	4
11	*Grewia spp*	3	4

3	*Grewia spp*	4	4
3	*Grewia spp*	4	5
11	Grewia spp	3	5
7	*Grewia spp*	2	5
4	*Grewia spp*	3	4
10	*Grewia spp*	3	3
2	*Grewia spp*	2	2
3	*Grewia spp*	3	3
3	*Grewia spp*	2	3
4	*Grewia spp*	3	4
31	*Grewia spp*	3	4
24	*Grewia spp*	2	4
8	*Grewia spp*	4	4
9	*Grewia spp*	2	3
4	*Grewia spp*	1	3
4	*Grewia spp*	3	3
6	*Grewia spp*	3	6
3	*Grewia spp*	4	6
7	*Grewia spp*	2	6
9	*Grewia spp*	2	2
3	*Grewia spp*	1	2
10	*Grewia spp*	2	3
4	*Grewia spp*	3	3
2	*Grewia spp*	1	4
8	*Grewia spp*	4	5
11	Grewia spp	3	5
9	*Grewia spp*	2	5
4	*Grewia spp*	2	5
14	*Grewia spp*	4	5
6	*Grewia spp*	3	5
6	*Grewia spp*	3	3
5	*Grewia spp*	2	3
1	*Grewia spp*	3	4
19	*Grewia spp*	2	4
15	*Grewia spp*	3	4
13	*Grewia spp*	3	3
3	*Grewia spp*	2	3
6	*Grewia spp*	2	4
19	*Grewia spp*	3	4
11	*Grewia spp*	4	4

17	*Grewia spp*	3	5
4	*Grewia spp*	2	2
10	*Grewia spp*	2	4
5	*Grewia spp*	2	3
2	*Grewia spp*	3	3
3	*Grewia spp*	2	5
3	*Grewia spp*	3	5
1	*Grewia spp*	4	5
9	*Lonchocarpus capassa*	2	3
3	*Lonchocarpus capassa*	2	4
8	*Lonchocarpus capassa*	3	4
3	*Lonchocarpus capassa*	4	4
2	*Lonchocarpus capassa*	1	3
5	*Lonchocarpus capassa*	2	3
4	*Lonchocarpus capassa*	3	3
5	*Lonchocarpus capassa*	3	7
7	*Lonchocarpus capassa*	2	3
1	*Lonchocarpus capassa*	3	3
1	*Lonchocarpus capassa*	4	4
5	*Lonchocarpus capassa*	2	4
1	*Lonchocarpus capassa*	2	4
5	*Lonchocarpus capassa*	3	5
8	*Lonchocarpus capassa*	4	5
2	*Natal wild pear*	4	5
15	*Natal wild pear*	2	6
8	*Natal wild pear*	3	6
6	*Natal wild pear*	4	6
2	*Natal wild pear*	1	6
9	*Ozaroa spp*	2	3
3	*Ozaroa spp*	1	3
11	*Ozoroa obovata*	3	5
5	*Ozoroa obovata*	2	5
9	*Ozoroa obovata*	4	5
7	*Ozoroa spp*	3	3
8	*Ozoroa spp*	3	7
10	*Ozoroa spp*	3	5
16	*Ozoroa spp*	4	5
5	*Ozoroa spp*	2	5
2	*Ozoroa spp*	3	4
3	*Peltophorum africanum*	2	2

6	*Peltophorum africanum*	1	6
7	*Peltophorum africanum*	1	7
3	*Peltophorum africanum*	2	7
4	*Peltophorum africanum*	4	7
3	*Peltophorum africanum*	3	7
4	*rock fig*	2	7
16	*rock fig*	3	7
1	*rock fig*	4	7
17	*Sansevieria trifasciata*	1	1
2	*Sansevieria trifasciata*	1	1
2	*Sansevieria trifasciata*	1	1
5	*Schotia brachypetela*	4	7
5	Schotia brachypetela	3	7
15	*Schotia brachypetela*	2	7
20	*Schotia brachypetela*	3	7
9	*Schotia brachypetela*	4	7
14	*Sclerocarya birrea*	1	2
6	*Scleroclarya birrea*	2	6
5	*Scleroclarya birrea*	3	6
3	*Scleroclarya birrea*	3	6
2	*Terminalia prunioides*	3	4
4	*Terminalia prunioides*	2	4
3	*Terminalia prunioides*	2	5
5	*Terminalia prunioides*	3	5
2	*Terminalia prunioides*	4	7
3	*Terminalia prunioides*	3	7
7	*Terminalia prunioides*	3	6
2	*Terminalia prunioides*	4	6
5	*Terminalia prunioides*	3	7
8	Terminalia prunioides	4	7
10	*Terminalia prunioides*	3	6
3	*Terminalia prunioides*	2	6
5	*Terminalia prunioides*	4	6
1	*Terminalia prunioides*	1	6
5	*Terminalia prunioides*	3	7
4	*Terminalia prunioides*	2	7
4	*Terminalia prunioides*	3	7
2	*Terminalia prunioides*	4	7
1	*Terminalia prunioides*	4	4
5	*Terminalia prunioides*	2	2

6	*Terminalia prunioides*	1	2
2	*Ximenia caffra*	3	4
2	*Ximenia caffra*	2	4
1	*Ximenia caffra*	3	3
2	*Ximenia caffra*	1	1
4526			

Key to Height Classes

Height Class	**Code**
0-0.5 m	1
0.51-1.0 m	2
1.01-1.5 m	3
1.51-2.0 m	4
2.01-2.5 m	5
2.51-3.0 m	6
3.0 m <	7

APPENDIX E

Vegetation Plots Inside 75% Minimum Convex Polygon Home Ranges

Number	**Species**	**Total Height (m)**	**Available?**
1	*Acacia erubescens*	3.0	Y
1	*Acacia erubescens*	0.5-1.0	Y
1	*Acacia erubescens*	1.0-1.5	Y
1	*Acacia erubescens*	3.5-4.0	Y
1	*Acacia erubescens*	2.5-3.0	Y
1	*Acacia erubescens*	1.5-2.0	Y
1	*Acacia erubescens*	4-4.5	Y
1	*Acacia erubescens*	>4.5	Y
2	Acacia erubescens	3.5-4.0	Y
2	Acacia erubescens	2.0-2.5	Y
1	Acacia erubescens	1.5-2.0	Y
1	Acacia erubescens	1.0-1.5	Y
1	*Acacia erubescens*	3.0-3.5	Y
1	*Acacia erubescens*	3.0-3.5	Y
1	*Acacia grandicornuta*	3.0-3.5	Y
1	*Acacia nigrensens*	0.5-1.0	Y
1	*Acacia nigresens*	2.5-3.0	Y
1	*Acacia nigresens*	3.5-4.0	Y
2	*Acacia nigresens*	1.0-1.5	Y
1	*Acacia nigresens*	4.0-4.5	Y
1	*Acacia nigresens*	>4.5	Y
2	*Acacia nigresens*	2.0-2.5	Y
1	*Acacia nigresens*	>4.5	Y
2	*Acacia nigresens*	>4.5	Y
1	*Acacia nigresens*	1.0-1.5	Y
1	*Acacia nigresens*	>4.5	N
1	*Acacia nigresens*	3.5-4.0	Y
1	*Acacia nigresens*	>4.5	Y
1	*Acacia nigresens*	>4.5	Y
1	*Acacia nigresens*	>4.5	Y
1	*Acacia nigresens*	2-2.5	Y

1	*Acacia nigresens*	>4.5	Y
1	*Acacia nigresens*	>4.5	Y
1	*Acacia nigresens*	>4.5	Y
1	*Acacia nigresens*	>4.5	Y
1	*Acacia nigresens*	>4.5	N
1	*Acacia nigresens*	3.5-4.0	Y
1	*Acacia nigresens*	>4.5	N
1	*Acacia nigresens*	>4.5	Y
1	*Acacia nigresens*	>4.5	Y
1	*Acacia nigresens*	>4.5	Y
1	*Acacia nigresens*	>4.5	Y
1	*Acacia nigresens*	>4.5	N
2	*Acacia nigresens*	>4.5	Y
1	*Acacia nigresens*	>4.5	Y
1	*Boscia albitrunca*	1.5-2.0	Y
1	*Boscia albitrunca*	1.5-2.0	Y
1	*Boscia albitrunca*	1.0-1.5	Y
1	*Boscia albitrunca*	2.0-2.5	Y
1	*Boscia albitrunca*	1.5-2.0	Y
1	*Boscia albitrunca*	1.5-2.0	Y
1	*Boscia albitrunca*	1.5-2.0	Y
4	*Boscia foetida*	0-0.5	Y
4	*Boscia foetida*	0.5-1	Y
1	*Boscia spp*	0.5-1.0	Y
1	*Boscia spp*	0-0.5	Y
4	*Boscia spp*	0-0.5	Y
4	*Boscia spp*	0.5-1	Y
6	*Boscia spp*	1.0-1.5	Y
1	*Brachylaena huilensis*	>4.5	Y
1	*Brachylaena huilensis*	2.5-3.0	Y
1	*Cassia abbreviata*	>4.5	Y
1	*Cassia abbreviata*	3.0-3.5	N
1	*Cassia abbreviata*	>4.5	N
1	Cassia abbreviata	2.5-3.0	Y
1	*Cassia abbreviata*	>4.5	N
1	*Combretum apiculatum*	3.5-4.0m	Y
3	*Combretum apiculatum*	1.5-2.0m	Y
1	*Combretum apiculatum*	>4.0 meter	Y
1	*Combretum apiculatum*	3.0-3.5 meter	Y
1	*Combretum apiculatum*	3.5-4.0m	Y

1	*Combretum apiculatum*	4.0-4.5	Y
1	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	4.0-4.5	Y
1	*Combretum apiculatum*	>4.5	Y
1	*Combretum apiculatum*	>4.5	Y
1	*Combretum apiculatum*	>4.5	Y
1	*Combretum apiculatum*	3.0-3.5	Y
1	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	2.5-3.0	Y
1	*Combretum apiculatum*	4.0-4.5	Y
1	*Combretum apiculatum*	3.0-4.5	Y
3	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	4.0-4.5	Y
1	*Combretum apiculatum*	2.5-3.0	Y
1	*Combretum apiculatum*	>4.5	N
2	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	3.0-3.5	Y
1	*Combretum apiculatum*	4.0-4.5	Y
4	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	4.0-4.5	Y
1	*Combretum apiculatum*	0.5-1.0	Y
1	*Combretum apiculatum*	3.0-3.5m	Y
2	*Combretum apiculatum*	>4.5	Y
1	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	3.0-3.5	Y
1	*Combretum apiculatum*	2.0-2.5	Y
2	*Combretum apiculatum*	>4.5	Y
1	*Combretum apiculatum*	3.0-3.5	Y
1	*Combretum apiculatum*	>4.5	Y
2	*Combretum apiculatum*	>4.5	Y
1	*Combretum apiculatum*	4-4.5	Y
3	*Combretum apiculatum*	4-4.5	Y
3	Combretum apiculatum	>4.5	Y
2	*Combretum Apiculatum*	4.0-4.5	Y
1	*Combretum Apiculatum*	3-3.5	Y
1	*Combretum Apiculatum*	>4.5	Y
1	*Combretum apiculatum*	2.5-3.0	Y
1	*Combretum apiculatum*	>4.5	N
1	*Combretum apiculatum*	2-2.5	N
1	*Combretum apiculatum*	2.5-3.0	Y

5	*Combretum apiculatum*	>4.5	Y
1	*Combretum apiculatum*	3-3.5	Y
1	*Combretum apiculatum*	3.5-4.0	Y
1	Combretum apiculatum	4.0-4.5	N
1	Combretum apiculatum	>4.5	Y
1	*Combretum apiculatum*	2.5-3.0	Y
2	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	3.0-3.5	Y
1	*Combretum apiculatum*	4.0-4.5	Y
1	*Combretum apiculatum*	0.5-1.0	Y
1	*Combretum apiculatum*	>4.5	N
2	*Combretum apiculatum*	3.0-3.5	Y
1	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	4.0-4.5	Y
1	*Combretum apiculatum*	1.5-2.0	Y
3	*Combretum apiculatum*	0.5-1.0	Y
2	*Combretum apiculatum*	3.5-4.0	Y
2	*Combretum apiculatum*	2.0-2.5	Y
2	*Combretum apiculatum*	1.0-1.5	Y
1	*Combretum apiculatum*	1.5-2.0	Y
1	*Combretum apiculatum*	3.0-3.5	Y
1	*Combretum apiculatum*	0.5-1.0	Y
1	*Combretum apiculatum*	2.5-3.0	Y
1	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	>4.5	N
2	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	4.0-4.5	N
1	*Combretum apiculatum*	>4.5	Y
1	*Combretum apiculatum*	>4.5	N
1	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	3.0-3.5	Y
1	*Combretum apiculatum*	4.0-4.5	N
1	*Combretum apiculatum*	4.0-4.5	Y
1	*Combretum apiculatum*	4.0-4.5	Y
1	*Combretum apiculatum*	3.0-4.5	Y
3	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	4.0-4.5	Y
1	*Combretum apiculatum*	2.5-3.0	Y
1	*Combretum apiculatum*	4.0-4.5	Y
1	*Combretum apiculatum*	1.5-2.0	Y

1	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculuatum*	3-3.5	Y
1	*Combretum apiculuatum*	>4.5	Y
1	*Combretum imberbe*	>4.5	N
3	*Combretum imberbe*	>4.5	N
1	*Combretum imberbe*	>4.5	Y
1	*Combretum imberbe*	2-2.5	Y
1	*Combretum imberbe*	0.5-1.0	Y
1	*Combretum imberbe*	>4.5	Y
1	*Combretum imberbe*	3.5-4.0	Y
1	*Combretum imberbe*	>4.5	Y
2	*Combretum imberbe*	>4.5	Y
5	*Combretum imberbe*	0.5-1.0	Y
4	*Combretum imberbe*	1.5-2.0	Y
1	*Commiphora spp*	4.0-4.5	Y
3	*Commiphora spp*	3.5-4.0	Y
1	*Commiphora spp*	>4.5	Y
1	*Commiphora spp*	2.0-2.5	Y
1	*Commiphora spp*	>4.5	N
1	*Commiphora spp*	>4.5	Y
1	*Commiphora spp*	1.5-2.0	Y
1	*Commiphora spp*	2.0-2.5	Y
1	*Commiphora spp*	3.0-3.5	Y
1	*Commiphora spp*	1.0-1.5	Y
2	*Commiphora spp*	4-4.5	Y
1	*Commiphora spp*	3.5-4.0	Y
1	*Commiphora spp*	0.5-1.0	Y
2	*Commiphora spp*	>4.5	Y
1	*Commiphora spp*	1.5-2.0	Y
1	*Commiphora spp*	0-0.5	Y
1	Commiphora spp	>4.5	Y
1	*Commiphora spp*	0.5-1.0	Y
1	*Commiphora spp*	1.5-2.0	Y
1	*Commiphora spp*	1.5-2.0	Y
2	*Commiphora spp*	>4.5	Y
4	*Commiphora spp*	0.5-1.0	Y
1	Commiphora spp	3.5-4.0	Y
2	*Commiphora spp*	>4.5	Y
2	*Commiphora spp*	1-1.5	Y
1	*Commiphora spp*	2.0-2.5	Y

1	*Commiphora spp*	2.5-3.0	Y
1	*Commiphora spp*	0.5-1.0	Y
1	*Commiphora spp*	3.5-4.0	Y
1	*Commiphora spp*	>4.5	Y
1	*Commiphora spp*	3.5-4.0	Y
2	*Commiphora spp*	>4.5	Y
2	*Commiphora spp*	1.0-1.5	Y
1	*Commiphora spp*	1.5-2.0	Y
1	*Commiphora spp*	>4.5	Y
1	*Commiphora spp*	1.5-2.0	Y
1	*Commiphora spp*	0.5-1.0	Y
1	*Commiphora spp*	0.5-1.0	Y
1	*Commpihora*	4.0-4.5	Y
1	*Dichrostachys cinera*	1.5-2.0	Y
1	*Dichrostachys cinera*	1.5-2.0	Y
1	*Dichrostachys cinera*	4.0	Y
1	*Dichrostachys cinera*	3.0	Y
1	*Dichrostachys cinera*	1.5	Y
1	*Dichrostachys cinera*	3.5-4.0	Y
1	*Dichrostachys cinera*	2.0	Y
1	*Dichrostachys cinera*	2.0-2.5	Y
1	*Dichrostachys cinera*	2.5-3.0	Y
1	*Dichrostachys cinera*	>4.5	Y
1	*Dichrostachys cinera*	3.5-4.0	Y
1	*Dichrostachys cinera*	2.5-3.0	Y
2	*Dichrostachys cinera*	2.5-3.0	Y
1	*Dichrostachys cinera*	3.5-4.0	Y
3	*Dichrostachys cinera*	>4.5	Y
1	*Dichrostachys cinera*	4.0-4.5	Y
1	*Dichrostachys cinera*	1.5-2.0	Y
1	*Dichrostachys cinera*	3.0-3.5	Y
1	*Dichrostachys cinera*	2.0-2.5	Y
1	*Dichrostachys cinera*	0.5-1.0	Y
1	*Dombeya cymosa*	3.5-4.0	Y
1	*Dombeya cymosa*	3.5-4.0	Y
1	*Euclea divinorum*	2.0-2.5	Y
2	*Euclea undulata*	1.5-2.0	Y
1	*Ficus sycomorus*	>4.5	Y
1	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	0.5-1.0	Y

6	*Grewia spp*	2.0-2.5	Y
11	*Grewia spp*	1.5-2.0	Y
2	*Grewia spp*	1.5-2.0	Y
3	*Grewia spp*	2.0	Y
1	*Grewia spp*	0.5-1.0	Y
2	*Grewia spp*	1.5-2.0	Y
2	*Grewia spp*	2.0	Y
1	*Grewia spp*	2.0	Y
1	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	1.5	Y
3	*Grewia spp*	0.5-1.0	Y
1	*Grewia spp*	1.5-2.0	Y
5	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	1.0-1.5	Y
1	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	2.0-2.5	Y
3	*Grewia spp*	2.0-2.5	Y
3	*Grewia spp*	1.0-1.5	Y
4	*Grewia spp*	1.5-2.0	Y
2	*Grewia spp*	2.0-2.5	Y
2	*Grewia spp*	2.5-3.0	Y
2	*Grewia spp*	1.5-2.0	Y
3	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	0.5-1.0	Y
2	*Grewia spp*	2.0-2.5	Y
2	*Grewia spp*	1.5-2.0	Y
2	*Grewia spp*	2.5-3.0	Y
2	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	2.0-2.5	Y
2	*Grewia spp*	3.0-3.5	Y
1	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	2.5-3.0	Y
2	*Grewia spp*	2.5-3.0	Y
5	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	1.0-1.5	Y
4	*Grewia spp*	1.5-2.0	Y

1	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	0.5-1.0	Y
12	*Grewia spp*	2-2.5m	Y
1	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	2.5-3.0	Y
6	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	1.5-2.0	Y
3	*Grewia spp*	1.5-2.0	Y
2	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	2.5-3.0	Y
3	*Grewia spp*	1-1.5	Y
1	*Grewia spp*	0.5-1.0	Y
1	*Grewia spp*	2-2.5	Y
4	*Grewia spp*	1-1.5	Y
2	*Grewia spp*	2-2.5	Y
3	*Grewia spp*	1-1.5	Y
1	*Grewia spp*	3.5-4.0	N
1	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	1-1.5	Y
2	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	2-2.5	Y
1	*Grewia spp*	0.5-1.0	Y
3	*Grewia spp*	2-2.5	Y
1	*Grewia spp*	3.5-4.0	Y
1	*Grewia spp*	0.5-1.0	Y
6	*Grewia spp*	1-1.5	Y
1	*Grewia spp*	2-2.5	Y
1	*Grewia spp*	1.5-2.0	Y
2	*Grewia spp*	2-2.5	Y
2	*Grewia spp*	0.5-1.0	Y
7	*Grewia spp*	1.5-2.0	Y
3	*Grewia spp*	3-3.5	Y
1	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	0.5-1.0	Y
3	*Grewia spp*	2-2.5	Y
2	*Grewia spp*	0.5-1.0	Y

1	*Grewia spp*	2.5-3.0	Y
4	*Grewia spp*	2-2.5	Y
1	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	3-3.5	Y
1	*Grewia spp*	1-1.5	Y
1	*Grewia spp*	1.0-1.5	Y
2	*Grewia spp*	1.5-2.0	Y
2	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	2.0-2.5	Y
1	Grewia spp	1.5-2.0	Y
1	Grewia spp	2.0-2.5	Y
1	Grewia spp	2.5-3.0	Y
2	Grewia spp	1.5-2.0	Y
2	Grewia spp	1.0-1.5	Y
1	Grewia spp	1.0-1.5	Y
1	*Grewia spp*	2.5-3.0	Y
3	*Grewia spp*	0.5-1.0	Y
2	*Grewia spp*	2-2.5	Y
2	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	3.0-3.5	Y
1	*Grewia spp*	3.5-4.0	Y
5	*Grewia spp*	1.5-2.0	Y
3	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	0.5-1.0	Y
4	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	1-1.5	Y
2	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	3.0-3.5	Y
2	*Grewia spp*	2.0-2.5	Y
2	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	1.0-1.5	Y
3	*Grewia spp*	1.5-2.0	Y
4	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	0.5-1.0	Y
1	*Grewia spp*	1-1.5	Y
3	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	1.5-2.0	Y

1	*Grewia spp*	1.0-1.5	Y
1	*Grewia spp*	2.0-2.5	Y
2	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	1.5-2.0	Y
4	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	3.5-4.0	Y
1	*Grewia spp*	2.5-3.0	Y
4	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	1.0-1.5	Y
1	*Grewia spp*	0.5-1.0	Y
1	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	1.5-2.0	Y
2	*Grewia spp*	2.0-2.5	Y
8	*Grewia spp*	1.5-1.0	Y
2	*Grewia spp*	1.0-1.5	Y
1	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	2.5-3.0	Y
2	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	3.0-3.5	Y
1	*Grewia spp*	1.0-1.5	Y
1	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	1.0-1.5	Y
1	*Grewia spp*	2.0-2.5	Y
12	*Grewia spp*	2.5-3.0	Y
6	*Grewia spp*	2.0-2.5	Y
6	*Grewia spp*	1.5-2.0	Y
3	*Grewia spp*	3.0-3.5	Y
2	*Grewia spp*	1.0-1.5	Y
1	*Grewia spp*	1.0-1.5	Y
1	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	0.5-1.0	Y
1	*Grewia spp*	1.0-1.5	Y
1	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	1.0-1.5	Y
1	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	1.0-1.5	Y
3	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	1.5-2.0	Y

1	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	0.5-1.0	Y
1	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	2.0-2.5	Y
2	*Grewia spp*	1.0-1.5	Y
3	*Grewia spp*	1.5-2.0	Y
4	*Grewia spp*	2.5-3.0	Y
3	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	2.0-2.5	Y
2	*Grewia spp*	1.0-1.5	Y
3	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	1.0-1.5	Y
1	*Grewia spp*	1.5-2.0	Y
2	*Grewia spp*	2.0-2.5	Y
2	*Grewia spp*	2.5-3.0	Y
2	*Grewia spp*	1.5-2.0	Y
3	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	0.5-1.0	Y
2	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	0.5-1.0	Y
3	*Grewia spp*	1.5-2.0	Y
2	*Grewia spp*	2.5-3.0	Y
2	*Gymnosporia buxifolia*	1.5-2.0m	Y
3	*Gymnosporia buxifolia*	0.5-1.0m	Y
4	*Gymnosporia buxifolia*	0-0.5m	Y
1	*Gymnosporia buxifolia*	1.5-2.0	Y
1	*Gymnosporia buxifolia*	1.5-2.0	Y
1	*Gymnosporia buxifolia*	1-1.5	Y
1	*Gymnosporia buxifolia*	3.0-3.5	Y
1	*Lannea schweinfurthii*	3.5-4.0	Y
1	*Lonchocarpus capassa*	2.0-2.5	Y
1	*Lonchocarpus capassa*	>4.5	Y
1	*Lonchocarpus capassa*	>4.5	Y
1	*Lonchocarpus capassa*	3.5-4.0	Y
1	*Lonchocarpus capassa*	3.0-3.5	Y
1	*Lonchocarpus capassa*	0.5-1.0	Y
1	*Lonchocarpus capassa*	2.5-3.0	Y
1	*Lonchocarpus capassa*	>4.5	Y

1	*Lonchocarpus capassa*	4.0-4.5	Y
1	*Opuntia ficus-indica*	0.5-1.0	Y
2	*Opuntia ficus-indica*	0-0.5	Y
1	*Ozaroa obovata*	3.5-4.0	Y
1	*Ozorao obovata*	1.5-2.0	Y
1	*Ozorao obovata*	2.5-3.0	Y
1	*Ozorao obovata*	1.5-2.0	Y
1	*Ozoroa spp*	2.0-2.5	Y
1	*Peltophorum africanum*	3.5-4.0	Y
1	*Peltophorum africanum*	3.0-3.5	Y
1	*Peltophorum africanum*	>4.5	Y
1	*Peltophorum africanum*	4.0-4.5	Y
1	*Peltophorum africanum*	3.5-4.0	Y
9	*Sansevieria trifasciata*	0-0.5	Y
5	*Sansevieria trifasciata*		
1	*Sansevieria trifasciata*	0-0.5	Y
1	*Schotia brachypetala*	>4.5	Y
1	*Schotia brachypetala*	>4.5	Y
1	*Scleroclarya birrea*	>4.5	Y
1	*Scleroclarya birrea*	4.0-4.5	Y
1	*Scleroclarya birrea*	>4.5	N
1	*Scleroclarya birrea*	>4.5	Y
1	*Scleroclarya birrea*	>4.5	N
1	*Scleroclarya birrea*	>4.5	Y
1	*Scleroclarya birrea*	>4.5	N
1	*Scleroclarya birrea*	>4.5	Y
1	*Scleroclarya birrea*	>4.5	Y
1	*Scleroclarya birrea*	>4.5	N
1	*Spirostaychys africana*	>4.5	N
1	*Termianlia pruniodes*	4.0-4.5	Y
1	*Termianlia pruniodes*	4.0-4.5	Y
1	*Termianlia prunioides*	4.0-4.5	Y
1	*Termianlia prunioides*	3.0-3.5	Y
1	*Terminalia pruniodes*	4.0-4.5	Y
1	*Terminalia pruniodes*	4.0-4.5	Y
1	*Terminalia prunioides*	4.0-4.5	Y
1	*Terminalia prunioides*	3.5-4.0	Y
1	*Terminalia prunioides*	1.5-2.0	Y
1	*Terminalia prunioides*	2.5-3.0	Y
1	*Terminalia prunioides*	2.0-2.5	Y

1	*Terminalia prunioides*	2.5-3.0	Y
1	*Terminalia prunioides*	3.5-4.0	Y
1	*Terminalia prunioides*	2.5-3.0	Y
1	*Terminalia prunioides*	4.0-4.5	Y
1	*Terminalia prunioides*	3.5-4.0	Y
1	*Terminalia prunioides*	3-3.5	Y
1	*Terminalia prunioides*	3-3.5	Y
2	*Terminalia prunioides*	>4.5	Y
1	*Terminalia prunioides*	4-4.5	Y
1	*Terminalia prunioides*	>4.5	Y
2	*Terminalia prunioides*	3.0-3.5	Y
1	*Terminalia prunioides*	2.0-2.5	Y
1	*Terminalia prunioides*	3.5-4.0	Y
1	*Terminalia prunioides*	4.0-4.5	Y
1	*Terminalia prunioides*	>4.5	Y
1	*Ximenia caffra*	2.0-2.5	Y
1	*Ximenia caffra*	1.0-1.5	Y
1	*Ximenia caffra*	1.0-1.5	Y
1	*Ximenia caffra*	1.5-2.0	Y
2	*Ximenia caffra*	1-1.5	Y
1	*Ximenia caffra*	0-0.5	Y
1	*Ximenia caffra*	1.5-2.0	Y
1	*Ximenia caffra*	1.5-2.0	Y
1	*Ximenia caffra*	1.5-2.0	Y
1	*Ziziphus mucronata*	2.0-2.5	Y
1	*Ziziphus mucronata*	1.0-1.5	Y
790			

APPENDIX F

Vegetation Plots Outside 75% Minimum Convex Polygon Home Ranges

Number	**Species**	**Total Height**	**Available?**
1	*Acacia erubescens*	2-2.5	Y
1	*Acacia erubescens*	2-2.5	Y
2	*Acacia erubescens*	3-3.5	Y
1	*Acacia erubescens*	0.5-1.0	Y
1	*Acacia erubescens*	2-2.5	Y
1	*Acacia erubescens*	1-1.5	Y
1	*Acacia erubescens*	2.0-2.5	Y
1	*Acacia erubescens*	3-3.5	Y
1	*Acacia erubescens*	<1m	Y
1	*Acacia erubescens*	1-1.5 m	Y
1	*Acacia erubescens*	4m	Y
1	*Acacia erubescens*	1.5-2.0	Y
1	*Acacia karoo*	3.5-4.0	Y
1	*Acacia karoo*	3-3.5	Y
1	*Acacia karoo*	1.5-2.0	Y
1	*Acacia karoo*	1.5-2.0	Y
1	*Acacia nigrensens*	2.0-2.5	Y
1	*Acacia nigrensens*	0.5-1.0	Y
1	*Acacia nigrensens*	2.0-2.5	Y
1	*Acacia nigrensens*	>4.5	Y
1	*Acacia nigrensens*	>4.5	N
1	*Acacia nigrensens*	>4.5	Y
2	*Acacia nigrescens*	2-2.5	Y
1	*Acacia nigresens*	>4.5	Y
1	*Acacia nigresens*	>4.5	Y
1	*Acacia nigresens*	>4.5	Y
1	*Acacia nigresens*	>4.5	Y
1	*Acacia nigresens*	2-2.5	Y
2	*Acacia nigresens*	3.0-3.5	Y
1	*Acacia nigresens*	3.5-4.0	Y

1	*Acacia nigresens*	1.0-1.5	Y
1	*Acacia nigresens*	3.0-3.5	Y
1	*Acacia nigresens*	1-1.5	Y
1	*Acacia nigresens*	>4.5	Y
1	*Acacia nigresens*	3-3.5	Y
1	*Acacia nigresens*	3.5-4.0	Y
1	*Acacia nigresens*	0.5-1.0	Y
2	*Acacia nigresens*	1.5-2.0	Y
1	*Acacia nigresens*	0.5-1.0	Y
1	*Acacia nigresens*	1.0-1.5	Y
1	*Acacia nigresens*	>4.5	Y
1	*Acacia nigresens*	0.5-1.0	Y
2	*Acacia nigresens*	1.0-1.5	Y
1	*Acacia nigresens*	>4.5	Y
1	*Acacia nigresens*	>4.5	N
4	*Acacia nigresens*	2.0-2.5m	Y
7	*Acacia nigresens*	1.5-2.0m	Y
1	*Acacia nigresens*	3.5-4.0m	Y
1	*Acacia nigresens*	<2	Y
1	*Acacia nigresens*	>4.5m	N
1	*Acacia nigresens*	4.0-4.5	Y
1	*Acacia nigresens*	2.5-3.0	Y
1	*Acacia nigresens*	>4.5	Y
1	*Acacia nigresens*	>4.5	N
1	*Acacia nigresens*	1.5-2.0	Y
1	*Acacia nigresens*	2.0-2.5	Y
1	*Acacia nigresens (knocked over)*	2.5-3.0	Y
1	*Balanites maughamii*	1.5-2.0	Y
1	*Boscia albitrunca*	1.5-2.0	Y
1	*Boscia albitrunca*	2-2.5	Y
1	*Boscia albitrunca*	1-1.5	Y
2	*Boscia albitrunca*	1.5-2.0	Y
1	*Boscia albitrunca*	0.5-1.0	Y
1	*Boscia foetida*	0.5-1.0	Y
1	*Boscia spp*	0.5-1.0	Y
1	*Cassia abbreviata*	>4.5	Y
2	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	1-1.5	Y
3	*Combretum apiculatum*	3.5-4.0	Y
3	*Combretum apiculatum*	3.0-3.5	Y

4	*Combretum apiculatum*	3.5-4.0	Y
1	Combretum apiculatum	2-2.5	Y
1	*Combretum apiculatum*	>4.5	Y
1	*Combretum apiculatum*	3-3.5	Y
3	*Combretum apiculatum*	3.5-4.0	Y
2	*Combretum apiculatum*	4-4.5	Y
1	*Combretum apiculatum*	3.5-4.0	N
2	*Combretum apiculatum*	>4.5	Y
2	*Combretum apiculatum*	2.5-3.0	Y
1	*Combretum apiculatum*	1.0-1.5	Y
1	*Combretum apiculatum*	>4.5	Y
1	*Combretum apiculatum*	1.0-1.5	Y
1	*Combretum apiculatum*	>4.5	N
2	*Combretum apiculatum*	2.5-3.0	Y
1	*Combretum apiculatum*	10-1.5	Y
1	*Combretum apiculatum*	>4.5	N
2	*Combretum apiculatum*	>4.5	N
2	*Combretum apiculatum*	4.0-4.5	Y
1	*Combretum apiculatum*	>4.5	Y
2	*Combretum apiculatum*	3.0-3.5	N
1	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	2.5-3.0	Y
1	*Combretum apiculatum*	1.5-2.0	Y
2	*Combretum apiculatum*	2.0-2.5	Y
1	*Combretum apiculatum*	2.5-3.0	Y
1	*Combretum apiculatum*	4.0-4.5	Y
3	*Combretum apiculatum*	3.0-3.5	Y
1	*Combretum apiculatum*	0.5-1.0	Y
1	*Combretum apiculatum*	3.0-3.5	Y
1	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	0.5-1.0	Y
1	*Combretum apiculatum*	4.0-4.5	Y
1	*Combretum apiculatum*	2.5-3.0	Y
1	*Combretum apiculatum*	>4.5	Y
1	*Combretum apiculatum*	3.0-3.5	Y
1	*Combretum apiculatum*	1.5-2.0	Y
2	*Combretum apiculatum*	>4.5	Y
2	*Combretum apiculatum*	1.5-2.0	Y
4	*Combretum apiculatum*	0.5-1.0	Y
1	*Combretum apiculatum*	0-0.5	Y

1	*Combretum apiculatum*	3.5-4.0	N
1	*Combretum apiculatum*	>4.5	Y
1	*Combretum apiculatum*	1.5-2.0	Y
1	*Combretum apiculatum*	0.5-1.0	Y
2	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	0.5-1.0	Y
1	*Combretum apiculatum*	2.0-2.5	Y
1	*Combretum apiculatum*	3.0-3.5	Y
1	*Combretum apiculatum*	3.5-4.0	Y
4	*Combretum apiculatum*	3.5-4.0	Y
2	*Combretum apiculatum*	2.0-2.5	Y
2	*Combretum apiculatum*	2.5-3.0	Y
2	*Combretum apiculatum*	3.0-3.5	Y
2	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	2.5-3.0	Y
1	*Combretum apiculatum*	0.5-1.0	Y
1	*Combretum apiculatum*	>4.5	Y
1	*Combretum apiculatum*	2.5-3.0	Y
1	*Combretum apiculatum*	0.5-1.0	Y
1	*Combretum apiculatum*	3.5-4.0	N
1	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	2.5-3.0	Y
2	*Combretum apiculatum*	4.0-4.5	Y
1	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	2.5-3.0	Y
2	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	3.0-3.5	Y
1	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	1.5-2.0	Y
1	*Combretum apiculatum*	3.5-4.0m	Y
1	*Combretum apiculatum*	2.0-2.5m	Y
1	*Combretum apiculatum*	1.5-2.0m	Y
1	*Combretum apiculatum*	3.5-4.0m	Y
1	*Combretum apiculatum*	>4.5m	Y
1	*Combretum apiculatum*	2.5-3.0m	Y
7	*Combretum apiculatum*	1.0-1.5	Y
4	*Combretum apiculatum*	0.5-1.0	Y
2	*Combretum apiculatum*	2.5-3.0	Y
2	*Combretum apiculatum*	2.0-2.5	Y

1	*Combretum apiculatum*	1.5-2.0	Y
2	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	1.0-1.5	Y
1	*Combretum apiculatum*	1.5-2.0	Y
4	*Combretum apiculatum*	3-4 ms	Y
1	*Combretum apiculatum*	3-4 ms	N
1	*Combretum apiculatum*	2-2.5	Y
3	*Combretum apiculatum*	3-4 ms	Y
1	*Combretum apiculatum*	2-3 ms	Y
3	*Combretum apiculatum*	<2	Y
1	*Combretum apiculatum*	2-3 ms	Y
3	*Combretum apiculatum*	2-3 m	Y
1	*Combretum apiculatum*	<2m	Y
2	*Combretum apiculatum*	3m	Y
3	*Combretum apiculatum*	2-3 m	Y
3	*Combretum apiculatum*	3-4 ms	Y
1	*Combretum apiculatum*	2.5-3.0m	Y
3	*Combretum apiculatum*	2.5-3.0m	Y
1	*Combretum apiculatum*	3.5-4.0m	Y
2	*Combretum apiculatum*	3.5-4.0m	Y
1	*Combretum apiculatum*	1.0-1.5m	Y
1	*Combretum apiculatum*	3.0-3.5	Y
1	*Combretum apiculatum*	4.0-4.5	Y
1	*Combretum apiculatum*	1.5-2.0	Y
3	*Combretum apiculatum*	3.0-3.5	Y
1	*Combretum apiculatum*	2.5-3.0	Y
1	*Combretum apiculatum*	4.0-4.5	Y
1	*Combretum apiculatum*	>4.5	Y
1	*Combretum apiculatum*	2.0-2.5	Y
1	*Combretum apiculatum*	3.0-3.5	Y
2	*Combretum apiculatum*	4.0-4.5	Y
1	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	2.5-3.0	Y
1	*Combretum apiculatum*	2.0-2.5	Y
2	*Combretum apiculatum*	2.5-3.0	Y
1	*Combretum apiculatum*	4.0-4.5	Y
1	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	3.0-3.5	Y
1	*Combretum apiculatum*	4.0-4.5	Y
1	*Combretum apiculatum*	3.5-4.0	Y

1	*Combretum apiculatum*	2.5-3.0	Y
1	*Combretum apiculatum*	3.0-3.5	Y
1	*Combretum apiculatum*	1.5-2.0	Y
1	*Combretum apiculatum*	2.0-2.5	Y
1	*Combretum apiculatum*	>4.5	Y
1	*Combretum apiculatum*	4.0-4.5	Y
1	*Combretum apiculatum*	4.0-4.5	Y
1	*Combretum apiculatum*	2.5-3.0	Y
1	*Combretum apiculatum*	3.0-3.5	Y
1	*Combretum apiculatum*	1.5-2.0	Y
1	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	4.0-4.5	Y
2	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	3.0-3.5	Y
1	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	1.5-2.0	Y
1	*Combretum apiculatum*	3.0-3.5	Y
1	*Combretum apiculatum*	3.0-3.5	Y
1	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	3.5-4.0	Y
1	*Combretum apiculatum*	3.5-4.0	Y
2	*Combretum apiculatum*	3.0-3.5	Y
1	*Combretum apiculatum*	>4.5	Y
1	*Combretum apiculatum*	1.0-1.5	Y
1	*Combretum apiculatum*	3.0-3.5	Y
1	*Combretum apiculatum*	>4.5	Y
1	*Combretum apiculatum*	3.0-3.5	Y
1	*Combretum apiculatum*	1.0-1.5	Y
1	*Combretum apiculatum*	3.5-4.0	Y
2	*Combretum apiculatum*	2.5-3.0	Y
1	*Combretum apiculatum*	2.0-2.5	Y
2	*Combretum apiculatum*	3.5-3.0	Y
1	*Combretum apiculatum*	2-2.5	Y
1	*Combretum apiculatum*	3.0-3.5	Y
2	*Combretum apiculatum*	2.5-3.0	Y
1	*Combretum apiculatum*	2-2.5	Y
4	*Combretum apiculatum*	2m	Y
3	*Combretum apiculatum*	3m	Y
1	*Combretum apiculatum (knocked over*	3.0-3.5	Y
1	*Combretum apiculatum down*		

1	*Combretum apiculatum(down)*	1.5-2.0	Y
1	*Combretum apiculatumdown*	2.0-2.5	Y
1	*Combretum apiculatum--knocked down*	3m	Y
1	*Combretum apiculuatum*	3.5-4.0	Y
2	*Combretum apiculuatum*	3.0-3.5	Y
1	*Combretum apiculuatum*	2.0-2.5	Y
1	*Combretum apiculuatum*	4.0-4.5	Y
3	*Combretum apiculuatum*	2.0-2.5m	Y
2	*Combretum apiculuatum*	3.5-4.0m	Y
1	*Combretum apiculuatum*	3.5-4.0	N
1	*Combretum imberbe*	3-3.5	Y
1	*Combretum imberbe*	3.5-4.0	Y
1	*Combretum imberbe*	>4.5m	Y
2	*Combretum imberbe*	>4.5	N
1	*Combretum imberbe*	3.5-4.0	Y
1	*Combretum imberbe*	1.0-1.5	Y
2	*Combretum imberbe*	0.5-1.0	Y
4	*Commiphoar spp*	>4.5	Y
1	*Commiphora*	3.0-3.5	Y
1	*Commiphora spp*	3-3.5	Y
2	*Commiphora spp*	>4.5	Y
2	*Commiphora spp*	1-1.5	Y
2	*Commiphora spp*	0.5-1.0	Y
4	*Commiphora spp*	0.5-1.0	Y
2	*Commiphora spp*	1.0-1.5	Y
1	*Commiphora spp*	3.0-3.5	Y
1	*Commiphora spp*	0.5-1.0	Y
1	*Commiphora spp*	4-4.5	Y
2	*Commiphora spp*	>4.5	Y
2	*Commiphora spp*	2.5-3.0	Y
2	*Commiphora spp*	4-4.5	Y
2	*Commiphora spp*	0.5-1.0	Y
1	*Commiphora spp*	>4.5	Y
1	*Commiphora spp*	2.5-3.0	Y
1	*Commiphora spp*	3.5-4.0	Y
1	*Commiphora spp*	1.0-1.5	Y
1	*Commiphora spp*	3.0-3.5	Y
2	*Commiphora spp*	0.5-1.0	Y
2	*Commiphora spp*	4.0-4.5	Y
1	*Commiphora spp*	2.0-2.5	Y

2	*Commiphora spp*	0.5-4.0	Y
1	*Commiphora spp*	0.5-1.0	Y
1	*Commiphora spp*	2.5-3.0	Y
1	*Commiphora spp*	0.5-1.0	Y
1	*Commiphora spp*	0.5-1.0	Y
15	*Commiphora spp*	0.5-1.0	Y
1	*Commiphora spp*	1.0-1.5	Y
1	*Commiphora spp*	4.0-4.5	Y
1	*Commiphora spp*	1.5-2.0	Y
1	*Commiphora spp*	1.0-1.5	Y
1	*Commiphora spp*	2.5-3.0	Y
2	*Commiphora spp*	0.5-1.0	Y
1	*Commiphora spp*	1.5-2.0	Y
1	*Commiphora spp*	1.5-2.0	Y
1	*Commiphora spp*	2-2.5	Y
1	*Commiphora spp*	4-4.5	Y
1	*Commiphora spp*	2.5-3.0m	Y
1	*Commiphora spp*	1.0-1.5m	Y
1	*Commiphora spp*	0.5-1.0	Y
1	*Commiphora spp*	4.0-4.5	Y
1	*Commiphora spp*	3-4 ms	Y
1	*Commiphora spp*	3-4 ms	N
1	*Commiphora spp*	2m	Y
1	*Commiphora spp*	2-3 ms	Y
1	*Commiphora spp*	2-3 ms	Y
1	*Commiphora spp*	<1m	Y
1	*Commiphora spp*	2-3 m	Y
1	*Commiphora spp*	1.5-2.0m	Y
1	*Commiphora spp*	2.0-2.5	Y
1	*Commiphora spp*	4.0-4.5	Y
1	*Commiphora spp*	>4.5	Y
2	*Commiphora spp*	>4.5	Y
1	*Commiphora spp*	3.5-4.0	Y
1	*Commiphora spp*	4.0-4.5	Y
1	*Commiphora spp*	2.5-3.0	Y
2	*Commiphora spp*	>4.5	Y
1	*Commiphora spp*	3.5-4.0	Y
1	*Commiphora spp*	1.0-1.5	Y
1	*Commiphora spp*	>4.5	Y
1	*Commiphora spp*	1.5-2.0	Y

1	*Commiphora spp*	3.0-3.5	Y
1	*Commiphora spp*	3.5-4.0	Y
2	*Commiphora spp*	3.5-4.0	Y
1	*Commiphora spp*	0.5-1.0	Y
1	*Commiphora spp*	2.5-3.0	Y
1	*Commiphora spp*	1.0-1.5	Y
1	*Commiphora spp*	2.5-3.0	Y
1	*Commiphora spp*	1.5-2.0	Y
1	*Commiphora spp*	0.5-1.0	Y
1	*Commiphora spp*	>4.5	Y
1	*Commiphora spp*	2.5-3.0	Y
1	*Commiphora spp ?*	1.0-1.5	Y
1	*Commiphora spp ?*	0.5-1.0	Y
1	*Commiphora spp down*	0.5-1.0	Y
1	*Commiphora sppknocked over*	1.5-2.0	Y
1	*Commiphora spp*	2-3 ms	Y
1	*Dichrostachys cinera*	2.5-3.0	Y
1	*Dichrostachys cinera*	2.5-3.0	Y
4	*Dichrostachys cinera*	1.5-2.0	Y
4	*Dichrostachys cinera*	1-1.5	Y
1	*Dichrostachys cinera*	0.5-1.0	Y
1	*Dichrostachys cinera*	2-2.5	Y
1	*Dichrostachys cinera*	1.0-1.5	Y
1	*Dichrostachys cinera*	2.5-3.0	Y
1	*Dichrostachys cinera*	0.5-1.0	Y
1	*Dichrostachys cinera*	2.0-2.5	Y
1	*Dichrostachys cinera*	1.5-2.0	Y
1	*Dichrostachys cinera*	<2m	Y
1	*Dichrostachys cinera*	1.5-2	Y
1	*Dichrostachys cinera*	2.5-3.0m	Y
4	*Dichrostachys cinera*	2-2.5m	Y
9	*Dichrostachys cinera*	1.5-2.0m	Y
1	*Dichrostachys cinera*	1.5-2.0m	Y
1	*Dichrostachys cinera*	2.0-2.5	Y
1	*Dichrostachys cinera*	1.5-2.0	Y
1	*Dichrostachys cinera*	2.0-2.5	Y
1	*Dichrostachys cinera*	2.0-2.5	Y
3	*Dichrostachys cinera*	2.0-2.5	Y
1	*Dichrostachys cinera*	1.0-1.5	Y
1	*Dichrostachys cinera*	1.5-2.0	Y

1	*Dichrostachys cinera*	1.5-2.0	Y
1	*Dichrostachys cinera*	0.5-1.0	Y
1	*Dombeya cymosa*	2.5-3.0m	Y
3	*Dombeya cymosa*	3.5-4.0	Y
1	*Dombeya cymosa*	2.5-3.0	Y
1	*Ehritia rigida*	<2	Y
1	*Ehritia rigida*	2m	Y
4	*Ehritia rigida*	<1m	Y
1	*Euclea divinorum*	2.5-3.0	Y
1	*Euclea divinorum*	1.5-2.0	Y
1	*Euclea divinorum*	1.0-1.5m	Y
1	*Euclea undulata*	1.5-2.0	Y
1	*Euclea undulata*	1.5-2.0	Y
1	*Grewia*	2.0-2.5	Y
1	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	0.5-1.0	Y
2	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	2-2.5	Y
1	*Grewia spp*	0-0.5	Y
2	*Grewia spp*	0.5-1.0	Y
1	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	1-1.5	Y
2	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	0.5-1.0	Y
2	*Grewia spp*	1-1.5	Y
1	*Grewia spp*	1-1.5	Y
1	*Grewia spp*	1-1.5	Y
1	*Grewia spp*	3.5-4.0	Y
6	*Grewia spp*	2-2.5	Y
2	*Grewia spp*	1-1.5	Y
5	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	1.5-2.0	Y
2	*Grewia spp*	0.5-1.0	Y
2	*Grewia spp*	1-1.5	Y
2	*Grewia spp*	1.5-2.0	Y
5	*Grewia spp*	0.5-1.0	Y
1	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	3-3.5	Y
1	*Grewia spp*	2-2.5	Y

1	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	2.5-3.0	Y
3	*Grewia spp*	1-1.5	Y
1	*Grewia spp*	0.5-1.0	Y
1	*Grewia spp*	2-2.5	Y
4	*Grewia spp*	2.5-3.0	Y
2	*Grewia spp*	2.0-2.5	Y
4	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	3.5-4.0	Y
2	*Grewia spp*	1.0-1.5	Y
1	*Grewia spp*	1.5-2.0	Y
2	*Grewia spp*	1.0-1.5	Y
7	*Grewia spp*	1.5-2.0	Y
3	*Grewia spp*	1-1.5	Y
1	*Grewia spp*	3.5-4.0	Y
2	*Grewia spp*	0.5-1.0	Y
5	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	3.5-4.0	Y
2	*Grewia spp*	0.5-1.0	Y
3	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	3.0-3.5	Y
3	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	0.5-1.0	Y
1	*Grewia spp*	2.0-2.5	Y
3	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	0.5-1.0	Y
4	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	3.5-4.0	Y
2	*Grewia spp*	3.5-4.0	Y
1	*Grewia spp*	1.5-2.0	Y
3	*Grewia spp*	1.0-1.5	Y
2	*Grewia spp*	0.5-1.0	Y
1	*Grewia spp*	1-1.5	Y
1	*Grewia spp*	3.5-3.0	Y
1	*Grewia spp*	0.5-1.0	Y
1	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	0.5-1.0	Y
2	*Grewia spp*	1.0-1.5	Y
2	*Grewia spp*	2.0-2.5	Y

1	*Grewia spp*	1.0-1.5	Y
3	*Grewia spp*	1.0-1.5	Y
1	*Grewia spp*	2.5-3.0	Y
4	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	0.5-1.0	Y
2	*Grewia spp*	2.0-2.5	Y
3	*Grewia spp*	0.5-1.0	Y
1	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	1.5-2.0	Y
4	*Grewia spp*	3.0-3.5	Y
2	*Grewia spp*	1.0-1.5	Y
2	*Grewia spp*	1.0-1.5	Y
2	*Grewia spp*	1.0-1.5	Y
1	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	1.0-1.5	Y
3	*Grewia spp*	1.5-2.0	Y
4	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	0.5-1.0	Y
1	*Grewia spp*	1-1.5	Y
3	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	2.5-3.0	Y
3	*Grewia spp*	0.5-1.0	Y
2	*Grewia spp*	2-2.5	Y
2	*Grewia spp*	1.5-2.0	Y
7	*Grewia spp*	1.0-1.5	Y
1	*Grewia spp*	0.5-1.0	Y
2	*Grewia spp*	1.5-2.0m	Y
1	*Grewia spp*	0.5-1.0m	Y
1	*Grewia spp*	0.5-1.0m	Y
1	*Grewia spp*	0.5-1.0m	Y
1	*Grewia spp*	2.0-2.5m	Y
20	*Grewia spp*	1.5-2.0	Y
5	*Grewia spp*	1.0-1.5	Y
5	*Grewia spp*	2.0-2.5	Y
5	*Grewia spp*	1.5-2.0	Y

1	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	3.0-3.5	Y
8	*Grewia spp*	1.5-2.0	Y
3	*Grewia spp*	2.5-3.0	Y
2	*Grewia spp*	0.5-1.0	Y
9	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	1.0-1.5	Y
1	*Grewia spp*	3.0-3.5	Y
7	*Grewia spp*	<2m	Y
2	*Grewia spp*	<2	Y
1	*Grewia spp*	2m	Y
5	*Grewia spp*	<1m	Y
1	*Grewia spp*	1-2 m	Y
2	*Grewia spp*	<1 m	Y
1	*Grewia spp*	2m	Y
2	*Grewia spp*	1m	Y
1	*Grewia spp*	0.5-1.0m	Y
1	*Grewia spp*	2-2.5m	Y
3	*Grewia spp*	1.5-2.0m	Y
2	*Grewia spp*	2.0-2.5m	Y
1	*Grewia spp*	1.5-2.0m	Y
1	*Grewia spp*	0.5-1.0m	Y
5	*Grewia spp*	1.5-2.0m	Y
4	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	0.5-1.0	Y
3	*Grewia spp*	1.0-1.5	Y
1	*Grewia spp*	2.0-2.5	Y
2	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	1.5-2.0	Y
2	*Grewia spp*	2.0-2.5	Y
2	*Grewia spp*	2.5-3.0	Y
4	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	3.0-3.5	Y
2	*Grewia spp*	1.0-1.5	Y
2	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	1.0-1.5	Y
4	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	2.0-2.5	Y

1	*Grewia spp*	0.5-1.0	Y
1	*Grewia spp*	2.0-2.5	Y
3	*Grewia spp*	1.5-2.0	Y
2	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	1.0-1.5	Y
1	*Grewia spp*	0.5-1.0	Y
2	*Grewia spp*	0.5-1.0	Y
2	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	1.5-2.0	Y
4	*Grewia spp*	1.0-1.5	Y
1	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	0.5-1.0	Y
1	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	1.5-2.0	Y
3	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	1.5-2.0	Y
2	*Grewia spp*	2.0-2.5	Y
1	*Grewia spp*	1.0-1.5	Y
1	*Grewia spp*	1.0-1.5	Y
1	*Grewia spp*	2.5-3.0	Y
1	*Grewia spp*	0.5-1.0	Y
1	*Grewia spp*	1.0-1.5	Y
1	*Grewia spp*	1.5-2.0	Y
3	*Grewia spp*	1.0-1.5	Y
5	*Grewia spp*	1.5-2.0	Y
4	*Grewia spp*	1.0-1.5	Y
4	*Grewia spp*	1.5-2.0	Y
1	*Grewia spp*	1.0-1.5	Y
1	*Grewia spp?*	0.5-1.0	Y
1	*Gymnosporia buxifolia*	1.5-2.0	Y
1	*Gymnosporia buxifolia*	1.5-2.0m	Y
3	*Gymnosporia buxifolia*	0.5-1.0m	Y
1	*Lannea schweinfurthii*	>4.5	N
1	*Lannea schweinfurthii*	>4.5	N
1	*Lannea schweinfurthii*	>4.5	Y
1	*Lannea schweinfurthii*	3.5-4.0	Y
1	*Lannea schweinfurthii knocked over*	3.5-4.0	Y
1	*Lonchocarpus capassa*	2.5-3.0	Y
1	*Lonchocarpus capassa*	>4.5	N
17	*Mother In laws tongue*		Y

14	*Mother in laws tongue*		
2	*Mother in law's tongue*		
5	Mother-in-laws tongue	0-0.5	Y
2	*Mother-in-law's tongue*	0-0.5	Y
1	*Ozorao obovata*	2.5-3.0	Y
1	*Ozoroa engleri*	2.5-3.0	Y
1	*Ozoroa spp*	1.0-1.5	Y
1	*Ozoroa spp*	3-3.5	Y
1	*Peltophorum africanum*	3.5-4.0	Y
1	*Peltophorum africanum*	2.5-3.0	Y
1	*Peltophorum africanum*	1.5-2.0	Y
1	*Peltophorum africanum*	0.5-1.0	Y
1	*Peltophorum africanum*	1.0-1.5	Y
1	*Peltophorum africanum*	2.0-2.5	Y
1	*Peltophorum africanum*	4.0-4.5	Y
1	*Peltophorum africanum*	4m	Y
1	*Peltophorum africanum*	>4,5	Y
3	*Prickly Pear*	0-0.5	Y
1	*Scleroclarya birrea*	>4.5	Y
1	*Scleroclarya birrea*	4-4.5	Y
1	*Scleroclarya birrea*	>4.5	N
1	*Scleroclarya birrea*	>4.5	N
1	*Scleroclarya birrea*	4.0-4.5	Y
1	*Scleroclarya birrea*	4.0-4.5	Y
1	*Scleroclarya birrea*	>4.5	N
1	*Scleroclarya birrea*	>4.5	Y
1	*Scleroclarya birrea*	>4.5	N
1	*Scleroclarya birrea*	>4.5	Y
1	*Scleroclarya birrea*	0-0.5	Y
1	*Scleroclarya birrea*	>4.5	N
1	*Scleroclarya birrea*	>4.5	D
1	*Scleroclarya birrea*	>4.5m	Y
1	*Scleroclarya birrea*	4.0-4.5m	N
1	*Scleroclarya birrea*	>4.5	Y
2	*Scleroclarya birrea*	>4.5	N
1	*Scleroclarya birrea*	>4.5	Y
3	*Scleroclarya birrea*	>4.5	N
1	*Scleroclarya birrea(knocked over)*	was >4.5	Y
1	*Spirostaychys africana*	>4.5	Y
3	*Spirostaychys africana*	>4.5m	N

1	*Spirostaychys africana*	>4.5	Y
1	*Spirostaychys africana*	>4.5	N
2	*Terminalia prunioides*	2-2.5	Y
1	*Terminalia prunioides*	3.5-4.0	Y
1	*Terminalia prunioides*	2.5-3.0	Y
1	*Terminalia prunioides*	2.5-3.0	Y
1	*Terminalia prunioides*	3-3.5	Y
4	*Terminalia prunioides*	3.5-4.0	Y
1	*Terminalia prunioides*	2.0-2.5	Y
2	*Terminalia prunioides*	2.5-3.0	Y
1	*Terminalia prunioides*	2.5-3.0m	Y
1	*Terminalia prunioides*	2.5-3.0	Y
1	*Terminalia prunioides*	1.5-2.0	Y
1	*Terminalia prunioides*	3m	Y
1	*Terminalia prunioides*	<2	Y
1	*Terminalia prunioides*	1.5-2.0	Y
1	*Terminalia prunioides*	3.5-4.0	Y
1	*Ximenia caffra*	1-1.5	Y
1	*Ziziphus mucronata*	1.5-2.0	Y
1	*Ziziphus mucronata*	1-1.5	Y
1	*Ziziphus mucronata*	1.0-1.5	Y
1	*Ziziphus mucronata*	1.5-2.0	Y
1	*Ziziphus mucronata*	1.0-1.5	Y
1	*Ziziphus mucronata*	2.0-2.5	Y
1022			

APPENDIX G

Electivity Indices, Diet Percentages, and Availability Percentages

Taxa	Electivity Index	% of Diet	% of Total Plants Available
Acacia erubescens	-0.826772448	0.198851	2.096985583
Acacia grandicornuta	-1	0	0.131061599
Acacia nigresens	-0.945341882	0.110473	3.931847969
Boscia albitrunca	-0.229891304	0.574459	0.917431193
Boscia spp	0.259221877	5.346885	3.145478375
Brachylaena huilensis	-1	0	0.262123198
Cassia abbreviata	-1	0	0.262123198
Combretum apiculatum	-0.689121105	2.629253	14.28571429
Combretum imberbe	-0.942219586	0.066284	2.228047182
Commiphora spp	-0.903720373	0.331418	6.553079948
Cordia monica	1	0.287229	0
Dichrostachys cinera	-0.943033131	0.088378	3.014416776
Diospyrus spp	1	0.154662	0
Dombeya cymosa	0.837331752	2.960672	0.262123198
Ehretia amoena	1	0.707026	0
Euclea divinorum	0.98731063	20.52585	0.131061599
Euclea spp	0.92740891	6.959788	0.262123198
Ficus sycomorus	-1	0	0.131061599
Euphorbia spp	1	7.60053	0
Grewia spp	-0.072747511	42.70879	49.4102228
Gymnosporia buxifolia	-1	0	1.703800786
Lannea schweinfurthii	-1	0	0.131061599
Lonchocarpus capassa	0.113080398	1.480336	1.179554391
Opuntia ficus-indica	-1	0	0.393184797
Ozoroa spp	0.482654169	1.878038	0.655307995
Peltophorum africanum	-0.065743619	0.574459	0.655307995
Ficus abutilifolia	1	0.463986	0
Sansevieria trifasciata	-0.618104465	0.463986	1.965923984
Schotia brachypetela	0.63975007	1.193106	0.262123198
Scleroclarya birrea	-0.119373454	0.618648	0.786369594

Spirostaychys africana	#DIV/0!	0	0
Terminalia prunioides	-0.312502266	1.922227	3.669724771
Ximenia caffra	-0.788897453	0.154662	1.31061599
Ziziphus mucronata	-1	0	0.262123198
		100	100

APPENDIX H

Visibility Indexes

Charley's Hide—Waterhole 1

Measurement	Visibility (m)
1	31
2	21
3	40
4	8
5	8
6	14
7	26
8	25
9	62
10	41
Average	27.6

Cambridge 7—Waterhole 2

Measurement	Visibility (m)
1	73
2	56
3	72
4	36
5	43
6	100
7	67
8	64
9	65
10	85
Average	66.1

Camwild—Waterhole 3

Waterhole	**Visibility (m)**
1	28
2	58
3	36
4	5
5	23
6	10
7	3
8	20
9	14
10	7
Average	20.4

Khuza Dam—Waterhole 4

Measurement	**Visibility (m)**
1	6
2	41
3	3
4	33
5	49
6	24
7	11
8	6
9	8
10	10
Average	19.1

Singwe Big Dam—Waterhole 5

Measurement	**Visibility (m)**
1	72
2	52
3	22
4	25
5	69
6	33
7	15
8	20
9	26
10	46
Average	38

Oxford West—Waterhole 6

Measurement	Visibility (m)
1	19
2	15
3	23
4	30
5	33
6	38
7	19
8	23
9	8
10	21
Average	22.9

Masodini—Waterhole 7

Measurement	Visibility (m)
1	19
2	8
3	30
4	24
5	14
6	22
7	1
8	49
9	17
10	1
Average	18.5

Koorts Pan—Waterhole 8

Measurement	Visibility (m)
1	27
2	23
3	18
4	5
5	13
6	26
7	10
8	25
9	23
10	32
Average	20.2

Ngala—Waterhole 9

Measurement	Visibility (m)
1	104
2	72
3	1
4	18
5	9
6	18
7	7
8	26
9	13
10	5
Average	27.3

Hardekool—Waterhole 10

Measurement	Visibility (m)
1	22
2	28
3	44
4	43
5	24
6	25
7	18
8	34
9	35
10	2
Average	27.5

Oxford East—Waterhole 11

Measurement	Visibility (m)
1	7
2	18
3	35
4	30
5	35
6	37
7	29
8	28
9	39
10	39
Average	29.7

APPENDIX I

Water Sample Results

			Waterhole Identification Number					
Variable	**units**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
pH	units	8.16	7.96	7.73	7.8	7.89	7.82	7.94
EC	mS/m	103.2	93	248.9	130.8	88.7	*59.8*	*149.5*
TDS	mg/L	395	409	1136	607	403	*259*	*680*
TEMP	deg C	22	22	22	22	22	22	22
Turb	ntu	2.28	12.9	7.22	6.58	71.8	37.4	6.02
ALK	mg/L	434	182	386	360	316	224	288
Ca	mg/L	12.027	32.8738	10.4234	15.2342	31.2702	*28.8648*	*18.4414*
Cl	mg/L	44	82	292	70	86	38	224
Mg	mg/L	244.71	152.074	385.682	286.766	123.046	126.504	292.822
T.H.	mg/L	252	172	392	296	142	144	304
Ca.H.	mg/L	30	82	26	38	78	72	46

		Waterhole Identification Number			
Variable	**units**	**8**	**9**	**10**	**11**
pH	units	7.75	8.08	8.55	8.56
EC	mS/m	130.8	167.9	160.4	112.6
TDS	mg/L	609	699	716	503
TEMP	deg C	22	22	22	22
Turb	ntu	5.11	8.94	3.97	51.7
ALK	mg/L	444	412	192	318
Ca	mg/L	*8.018*	*16.8378*	*21.6486*	*26.4594*
Cl	mg/L	112	168	216	94
Mg	mg/L	301.14	335.794	354.878	225.962
T.H.	mg/L	306	346	368	242
Ca.H.	mg/L	20	42	54	66